ILLUSTRATED
ELECTRICAL REVIEW
A Journal of Scientific and Electrical Progress.

VOL. 31. No. 1. WEEKLY. | NEW YORK, WEDNESDAY, JULY 7, 1897. | $3 PER ANNUM. Single Copies, 10 Cents.

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VIEWS, NEWS AND INTERVIEWS.

Within a few days the last cable car in Pittsburgh has been supplanted by the trolley car, and now Pittsburgh has a complete electric street-car system.

On the day of the Queen's jubilee the Postal Telegraph Cable Company achieved notoriety by floating a British flag from the top of its building in Broadway, New York city. It was one of a very few such flags shown in New York on that day.

Under date of June 24 the Direct United States Cable Company, Limited, issued the following circular:

Commencing July 1 the following alterations will be put into force over this company's lines:
Messages written entirely in *plain language* will be accepted at the rate of *fifteen* (15) letters to the word.
Groups of figures or letters will be counted at the rate of five figures or letters to a word, plus one word for any excess.
In code messages the maximum length of a word is fixed at ten letters.
Mixed messages, viz., those composed of code and plain words, will be counted and charged for at the rate of ten letters to a word.

A correspondent writes to us for information concerning the so-called carbon "trust." There is believed to be an understanding as to prices among several of the manufacturers of carbons, but the Solar, Partridge, Washington, Phœnix, Crouse-Tremaine and New York Carbon companies are understood not to be included in the agreement.

Jubilee Telegrams From Queen Victoria.

At 11 o'clock A. M., on June 22, Queen Victoria caused the following message to be sent over the private wire from Buckingham Palace into the Central telegraph office, in London, whence it was sent to every part of the British Empire:

"From my heart I thank my beloved people. May God bless them. V. R. ET. I."

The Queen pressed a button, which was the signal to dispatch the telegram. In two minutes the message had passed Teheran to the far East, and in 16 minutes a reply was received from Ottawa. By the time the Queen returned to the palace, at 1.45 P. M., all of the replies had been received, except those from the Fiji, Falkland and Thursday Islands. The message was sent to 43 places.

Mr. Nicholls's Appreciation of the Technical Press.

TO THE EDITOR OF ELECTRICAL REVIEW:

My term of office as president of the National Electric Light Association expiring on the 1st proximo, I desire, as one of the last acts of my administration, to thank yourself and the editors of other electrical journals, officially and personally, for the interest you have shown in the work of the association during the past year, and for your kindness in promptly publishing any information that has been forwarded to you for that purpose by the association.

As I took occasion to point out in my annual address, the electrical industry at large owes a debt of gratitude to the electrical press, and for my part I am glad to have had an opportunity of acknowledging this obligation. Yours very truly,

FREDERIC NICHOLLS.

Toronto, June 21.

The paragraphs in his address to which Mr. Nicholls refers are as follows:

"Notwithstanding the progress that has been made in the perfection of apparatus and the application of new principles, there never was a time when there was more to learn than now, and no more fitting occasion is likely to present itself to us to familiarize ourselves with the latest procedure in our chosen profession, and the papers to be read and the discussions thereon will find hundreds of thousands of readers and students, thanks to the electrical journals of which we are all justly proud.

"No other art, science, industry or profession has been so well and faithfully served by an enlightened and progressive technical press as our own, and who can estimate the fair share of credit justly their due for the part they have taken in aiding and advancing the introduction of electro-motive force in its many and varied applications?"

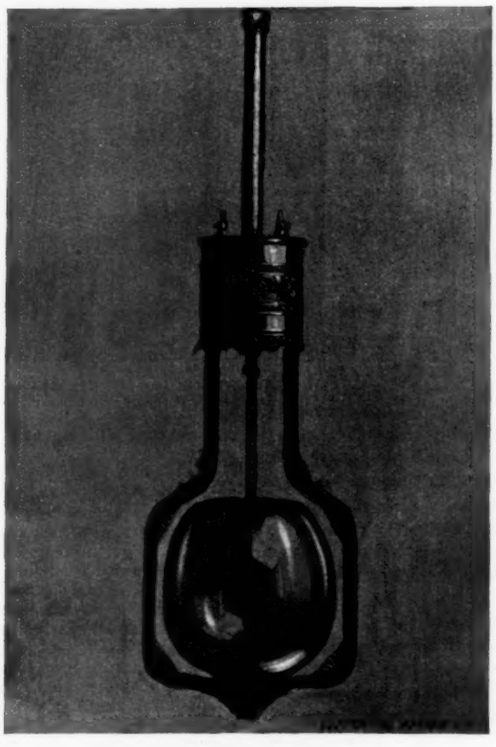


FIG. 1.—LANE'S ARC LAMP.

A New Arc Lamp.

Mr. George M. Lane, of Asbury Park, N. J., has been awarded a patent on a new arc lamp, illustrated herewith.

This lamp is the outgrowth of careful study and practical tests. It is very simple in construction and is regulated entirely by the electric current, no springs, dash-pots or other means of adjustment being required. The arc is regulated by a pre-determined resistance between the terminals, and not by the strength of the current, hence it is evident that the lamp will burn equally well on any arc circuit, either full or half arc, without adjustment or change.

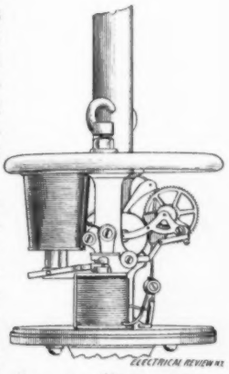


FIG. 2.—MECHANISM OF LANE'S ARC LAMP.

In operation the lamp is trimmed with carbons separated; when the current is turned on, a starting magnet releases the clock-work, allowing the upper carbon to descend; as soon as it touches the lower carbon a short circuit is formed through the carbons and re-lighter magnet; the current now being cut off from the starting magnet, it loses its magnetism and the armature drops, and as it is so pivoted that its weight overcomes the weight of carbon rod and carbon, it raises the latter, thereby establishing the arc.

As the carbons burn away and the resistance between them becomes greater than the resistance of the shunt magnet, the armature is again attracted and drawn upward, releasing the clock-work and allowing the upper carbon to feed down in a well known manner. The lamps are made either single or double, and a clutch feed may be used in place of clock-work, if desired.

This lamp has been examined by a number of experts in arc lighting, and they all pronounce it a complete success. Mr. Lane may be said to have gained another point toward the perfection of arc lighting.

MAGNET AND COIL WINDING.

BY J. MASON KNOX.

In 1820 Oersted discovered that a wire carrying a current would affect a magnetic needle placed in its vicinity. In the same year Arago and Ampère took up the investigation and made helices of wire by means of which they magnetized steel needles. Five years later William Sturgeon made the first real electro-magnet, using a soft iron core and a single layer of bare wire for the exciting coil. This crude instrument was almost immediately improved upon by the substitution of coils consisting of several layers of insulated wire, and in 1828 Prof. Joseph Henry made the first "tightly wound" electro-magnet. He, too, first pointed out the advantages to be gained in telegraph work by the use of magnets wound with many turns of fine wire.

Probably there is no one piece of apparatus which has done so much to make modern electrical engineering a possibility as this simple helix of wire, carrying a current. Nearly every form of applied electricity requires an electro-magnet or coil in some form or other; without it, telegraphy, telephony, electric gas-lighting and even the dynamo itself (which is essentially two electro-magnets) could not exist.

In view of this it would, at first sight, seem strange that there is not more available information to assist in the design of magnets and induction coils. The literature on the subject is relatively meager, the data given almost useless for design, as the slightest variation of shape, etc., renders the results widely inaccurate. Many engineers, who would have little difficulty in designing an alternator, would be perplexed if asked to design an efficient electro-magnet to lift a pound at a distance of three inches, and even after solving this problem they would be about as much in the dark as ever if the distance was increased to four inches.

It seems strange that, while vast improvements were being made in all branches of electrical science, no radical change was made in magnet winding, the few that considered the matter at all expending their energies almost entirely in investigating the magnetic circuit, studying the magnetic properties of iron, shortening the path traversed by the lines of force, decreasing the air-gaps and reducing leakage.

Several improvements in winding were suggested, but each was abandoned in turn as being unadvantageous in one way or another. The experiment was tried of making the coils entirely of iron wire, but it was found that the increased resistance counterbalanced any benefit that might be derived from the improvement in the magnetic circuit.

In 1869 Mr. Lyttle wound some magnets in which, after winding one layer, the wire was brought back and the second layer begun at the same end of the magnet as the first. Mr. Lyttle claimed that in this way a much stronger coil was produced, but the only apparent difference between this method and the old one lies in the fact that his magnets are much more difficult to wind.

It was not until the Spring of 1893, when Richard Varley, Jr., took out a patent for his duplex winding, that any radical improvement was made in this branch. By his method two wires are wound simultaneously, side by side, one of the wires being insulated and the other bare, the covering of the one wire serving to insulate both, and between the successive layers of wire, sheets of patented fringed paper are introduced.

These magnets when wound have four ends of wire, two of which are usually connected, throwing the two windings in series; but when the magnets are desired for some special work, the ends may be connected in multiple, or the two windings may be connected to separate circuits.

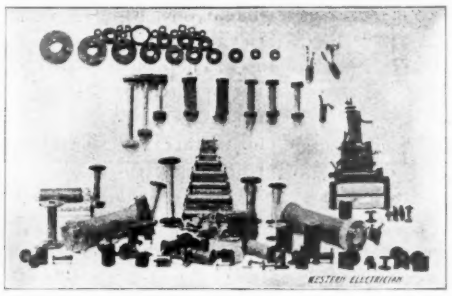


FIG. 1.—A GROUP OF ELECTRO-MAGNETS AND COILS.

The fact that these coils have four ends makes it possible to test them for insulation or cross, a thing which is practically impossible in the ordinary winding.

The strength of a magnet, other conditions remaining the same, is proportional to the number of turns of wire on the coil and to the current the wire is carrying. This being the case, it is of the utmost importance to wind magnets with as many turns as possible, and with as large a wire as circumstances will permit. The result of using a large wire is, of course, to reduce the resistance of the magnet, and, consequently, to increase the current; but heretofore, by the ordinary method of winding, an increase in the size of wire necessitated a decrease in the number of turns on the magnet. By the duplex method, however, half the space formerly occupied by insulation is saved, so that, by using a bare wire for half the winding, it becomes possible to utilize in copper, space that would otherwise be filled with insulation; i. e., without reducing the number of turns on the magnet, we can use a bare wire for half the winding, which shall be equal in diameter to the outside diameter of the covered wire, including insulation.

By this method the resistance is greatly lessened and the current correspondingly increased without the sacrifice of any turns. In cases where an increase of current is not desirable, the space saved, instead of being occupied by wire of increased cross-section, is filled with additional turns. Looking at the duplex winding from either standpoint, a given number of turns means more current, or a given resistance means more turns; in both cases the result is more ampere turns and greater strength.

From a commercial point of view this method is of the first importance, as coils manufactured under these patents are much less costly than those manufactured in the old way; one of the large items of saving being the difference in price between bare and covered wire on half the winding.

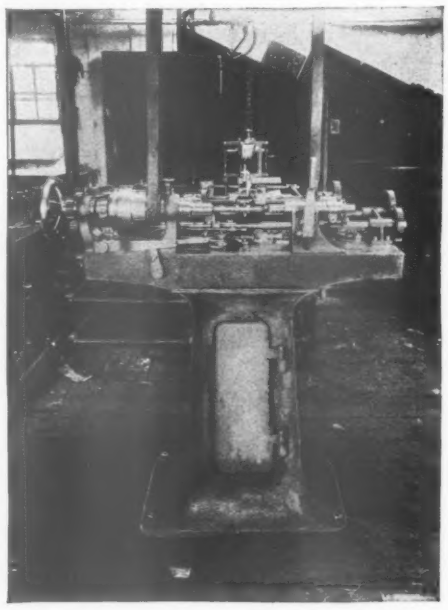


FIG. 2.—THE VARLEY DUPLEX MAGNET COMPANY'S NEW AUTOMATIC MAGNET AND COIL WINDER.

Until quite lately nearly all magnets were wound by hand, but during the past year the Varley Duplex Magnet Company has designed and built a large number of machines, which do away with hand winding entirely. The coils wound by these machines are wound with absolute accuracy; each layer is perfect, and there is no "sneaking" or "falling" of the wires from their proper layers.

These machines have recently been adapted for the so-called "French" winding of the secondaries of small induction coils. In the French winding no covered wire is used, the winding consisting wholly of bare wire, between the successive convolutions of which is wound a thread of cotton or silk to insure positive separation. This method has been tried before, but has never come into general use, as it is almost impossible to apply it successfully without special machinery.

Electric Heater Suit.

The Consolidated Car Heating Company has brought a bill in equity against the American Electric Heating Corporation and the West End Street Railway Company, of Boston, for an accounting and an injunction to restrain the defendants from alleged infringement of a patent on electric heaters.

THE CENTRAL LONDON RAILWAY.

NEW UNDERGROUND ELECTRIC ROAD EQUIPPED WITH AMERICAN APPARATUS.

The most recent addition to the system of underground railways with which London is provided, and the most important of all the present undertakings of a similar character in the world, the Central London Railway (underground) has an especial interest for Americans. This is due to the fact that the entire system of electrical equipment will be American. With the exception of the elevators, the entire electrical contract has been assumed by the British Thomson-Houston company, Limited, representing in Great Britain the General Electric Company, of Schenectady, while the elevator contract has been secured by Mr. Frank J. Sprague, of New York. The road, laid in two deep subway tunnels, driven by the Greathead shield, stretches from Liverpool street, beneath the station of the Great Eastern Railway Company, near Broad street, the city terminus of the North London Railway and the Bishopgate street station of the Metropolitan Underground Railway, through the very center of the great commercial district of the city, and runs due west under Holborn, High Holborn, Oxford street and past Hyde Park as far as the generating station, located at the terminus at Shepard's Bush. It follows the line of greatest traffic in London. The road will receive passengers from the great underground central depot, now in course of construction by the Central Railway Company, between the Bank of England and the Royal Exchange, passengers brought in by the main lines of the London & Northwestern, Midland and London & Southwestern railroads. It is especially at this point in the city that crossing is a perilous task, and the railroad company is now engaged in constructing a series of subways immediately below the surface for the convenience of pedestrians and as approaches to its own station below. From this central depot will radiate not less than five underground tunnels, some 85 feet below the surface each feeding a separate and equally populous district of the great agglomeration known as London.

The construction of the road itself has been carried out by the Electric Traction Company, which has also financed it. It is this company that has made the contracts with the British Thomson-Houston company, which will turn over the road, fully equipped and in working order, to the Central London Underground Railway Company, ready for operation.

It was not until three years after the necessary parliamentary act was passed, in 1893, that the actual work of building this road could be undertaken. Vertical shafts were driven at six different points to a depth of between 60 feet and 70 feet, and the tunneling was begun in four tunnels at once, two running in each direction from the shaft. At each of the sta-

tions were driven two shafts 23 feet in diameter and 87 feet deep, and one 18 feet in diameter and 76 feet deep, the two former containing two ingress and two exit elevators, and the smaller two spiral stairways, one for ascending and the other for descending passengers. The shafts are built up of cast-iron plates one and one-eighth inch thick and four and one-half inches in the flanges. All crevices in the back of the plates are filled with hydraulic lime grout, injected under pressure.

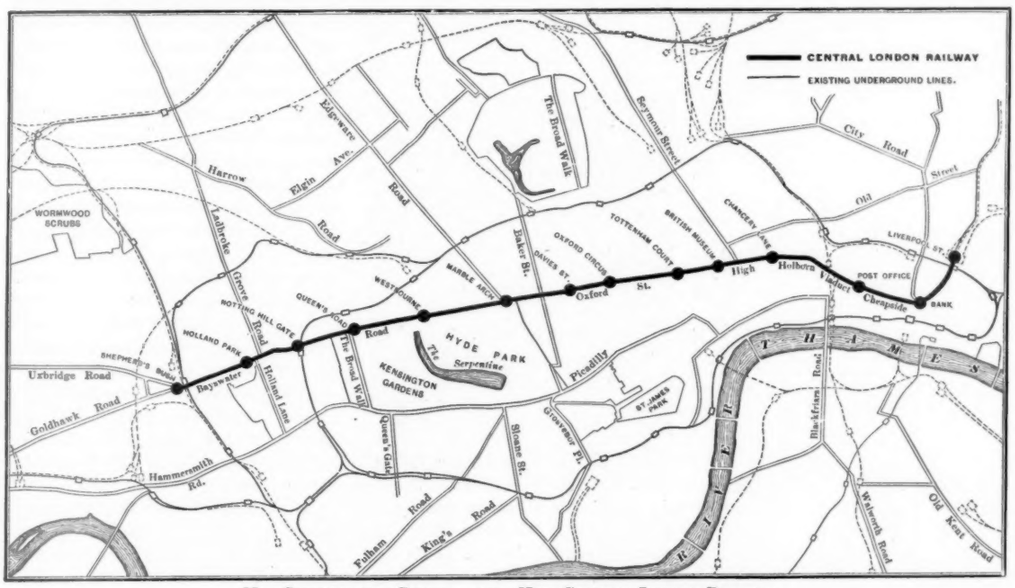
The glazed white brick passages leading from the bottom of the shafts to the stations are eight feet three inches wide on the entrance side. On the exit side, where crowds might collect in front of the elevators, they are 13 feet wide.

At the stations, the widened tunnel is 21 feet in diameter and 375 feet long. The main tunnels are each 11 feet 6 inches in diameter, and are practically steel tubes driven forward through the clay. The plates used to line these tunnels are seven-eighths inch thick, with flanges four inches deep. The shield for driving the small tunnels was 12 feet 8 inches in diameter, and was pushed forward by six hydraulic rams, giving a pressure of 230 tons. For driving the station tunnels the shield was 23 feet 8 inches in diameter, and was pushed forward by 22 rams, giving a pressure of 840 tons.

Each tunnel will contain one track, one tunnel carrying the east-bound trains, the other the west-bound trains.

In laying the roadbed the best modern steam railway practice has been followed. The steel rails weigh 100 pounds to the yard, and are laid upon heavy cross-ties. The system of contact will be the third rail, with the contact rail placed between the service rails of the track and insulated by insulators. The conductors will be fed at intervals from a copper-feeder cable. This feeding will be controlled from the signal boxes, and the operator will be able to cut out any section of the line when necessary. This method of contact is similar to that employed so successfully by the General Electric Company in the installations on the East Weymouth, Nantasket Beach and Berlin-Hartford branches of the New York, New Haven & Hartford Railroad. The method of traction, however, will differ radically from that used on the branches above mentioned. Instead of passenger-carrying motor cars, with the motors mounted on the forward axle, locomotives similar in appearance to those used on the Belt Line tunnel service of the Baltimore & Ohio will be used to haul the trains.

The reason for this lies in the fact that the tunnel is only 11½ feet in diameter, and that the bottom of the tunnel must accommodate the roadbed. This materially reduces the clearance. The motors require to be suspended between 30-inch wheels, at least, to give the necessary clearance between them and the ground, and this fact has brought about the locomotive in place of the passenger motor car.



MAP SHOWING THE ROUTE OF THE NEW CENTRAL LONDON RAILWAY.

The total length of the road is six and one-half miles, from the station at Shepard's Bush to the Mansion House, or 13 miles of single track. There will be 14 stations, including the termini, located at the following points, running east from Shepard's Bush: Holland Park, Notting Hill Gate, Queen's Road, Westbourne, Marble Arch, Marylebone Lane, Oxford Circus, Tottenham Court Road, the British Museum, Chancery Lane, Holborn Viaduct, the Mansion House and Liverpool street. In designing the line, a decided departure has been made in the arrangements of the station approaches. As the railway company is not embarrassed by any considerations of grade, as in the case of surface railroads, the plan was adopted of making the road act as an auxiliary to the operation of the trains as well as merely to carry them. On each side of each station is a three per cent gradient rising on the approaching side and falling again to the level of the road on the departing side. This unique method gives a retarding effect to all trains approaching the stations, equivalent to the application of considerable breaking power, while materially aiding in the acceleration of all trains as they leave the platforms. Furthermore, the saving in power necessary to secure the requisite rapid acceleration is, by the adoption of this plan, calculated to amount to about 33 per cent.

The schedule speed of the trains will be 14½ miles an hour, with stops at each station of 20 second. The trains will be run at first under a headway of two and one-half minutes, which will be reduced as soon as the traffic demands to a headway of two minutes.

The generating station will be located in the open air at the extreme western end of the line, near Shepard's Bush station. In building this the most modern American methods will be followed. The steam will be supplied from Babcock & Wilcox boilers, and the engines, of which there will be six, will be horizontal Allis machines, each of 1,300 horse-power.

The electrical system adopted is the three-phase alternating, high-voltage primary with reducing transformers and rotary converters, similar in general principle to that installed successfully by the General Electric Company for the roads between Lowell, Mass., and Nashua, N. H., and at Portland, Ore., between Niagara Falls and Buffalo, and on the line between Dublin and Dalkey in Ireland.

The dynamos, of which there will be six, will each be directly driven by its own engine. These dynamos are of the newly developed rotating field and stationery armature type. Each will have a capacity of 850 kilowatts. The speed of revolution will be 94, the frequency 25 cycles, and the initial voltage 5,000 volts. The total capacity of the power station will be 5,100 kilowatts, or 6,800 horse-power.

From the switchboard the current is carried to the converter substations, of which there are four. Two of these will contain seven step-down static transformers, six for service and one in reserve, each of 300 kilowatts capacity, and two rotary converters, each of 900 kilowatts capacity. The other two stations will contain four 300 kilowatt static transformers, and one 900 kilowatt rotary converter. In the transformers the voltage of the current will be reduced from 5,000 volts to 330 volts alternating, at which pressure it will enter the alternating side of the rotary converters, issuing from the commutator side direct railway current at 500 volts. The spare transformers, mentioned above, will be put into service when the headway of the trains is reduced. The static transformers are of the air-blast type, the windings being cooled by air forced through them by a blower. The rotary converters will be similar in construction to those used at Niagara, Buffalo and Nashua.

The use of the sub-station method of electrical distribution insures a uniform pressure throughout the entire length of the line. Fluctuation, therefore, which would materially interfere with the lighting of the station and trains, is reduced to a minimum. The limit of variation fixed by the Board of Trade, to the rules of which department all electrical installations in Great Britain must accord, is 10 volts. With the method adopted in this installation, the variation in pressure will not exceed three volts.

The locomotives will number 35. Each will consist of a sheet-iron cab containing the controller, indicating instruments, air brake, pump and controller, sand boxes, etc., mounted upon a locomotive truck. The motors have been especially designed for this work. They are of the gearless type, and, according to the new system of motor nomenclature adopted by the General Electric Company, are known as the G. E. 56. Four of these motors will be mounted on each locomotive, one to each axle, the total drawbar pull being 14,000 pounds. The controllers will be of the series parallel type, arranged for four motors. Each controller will embody the magnetic blowout principle.

The weight of each locomotive complete will be 35 tons of 2,240 pounds. The trains will be made up of seven cars, weighing when loaded 105 tons additional, giving a total train weight of 140 long tons. The seating capacity is calculated at 336 persons.

Access to and exit from the stations will be effected by means of powerfull high-speed elevators. These will also be of American manufacture and will be built by the Sprague Electric Elevator Company, of New York. The elevators will be 49 in number; each will have a capacity of 15,000 pounds or about 100 passengers per trip. The speed of elevation will be about 150 feet per minute. These elevators will be of the double drum type, similar to those built for the War Department at Washington, but of much higher carrying capacity.

It is estimated that the number of passengers which this road will carry per annum is 48,000,000, which at an average fare of 4 cents, will give an ample return to insure dividends upon the capital stock.

Henry C. Payne, of Milwaukee, Wis., will recommend to eastern capitalists to construct an interurban electric line from Neenah to Kaukauna. It is understood that work will be begun soon. The cost is estimated at $200,000 to $300,000.

THE NIAGARA-BUFFALO TRANSMISSION LINE.

READ BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, JUNE 9, 1897, BY J. G. WHITE.

(*Continued from page 310, vol. 30.*)

Before closing, it is natural to ask: "Is the line as built a genuine success? Can it be depended on, and is it effective?"

In answering, let me give briefly some of the facts. The line now in operation is over 25 miles long, of which the last 4,000 feet is under ground, the current being carried in lead-covered cables with rubber insulation, these having been drawn into a terra-cotta duct conduit built specially as part of this line. These cables successfully withstood a test of 40,000 volts; are guaranteed for five years under working pressure up to 25,000 volts, and were punctured during test only by a pressure estimated by Mr. Lincoln as about 80,000 volts. They have given no trouble since current was first turned on the line, November 15 last, except at two joints imperfectly made. Except for the short time needed to repair one of these joints, there has not been a single shutdown chargeable to the transmission line itself since the last temporary insulators were removed, some three or four months ago. A number of interruptions to service have occurred during that time, due to derricks used on the work now being done on the Erie Canal hitting wires, undermining of poles and conduit by this work, and to allow new lightning arresters to be put in circuit at transformer houses. Except for those extraneous and unusual causes the service has been perfect, with the one slight exception above noted. One short interruption early last Winter was due to a dead limb of a tree blowing across the wires, illustrating the fact that all trees should be cut down for some considerable distance on both sides of any high-voltage line. The line shows an insulation resistance of some 250,000 to 300,000 ohms on wet, and about 1,000,000 ohms on dry, days, this being between any one of the three wires and the ground, the insulation, therefore, varying from six to 25,000,000 ohms per mile of wire.

The actual working efficiency, as shown by the wattmeters in the low-tension alternating circuits at Niagara and the direct-current, 500-volt circuit at Buffalo, was 79.6 per cent, this being for a considerable period and a fluctuating load. This efficiency included loss in step-up transformers, line, step-down and rotary transformers. It is probable that any decrease in this, due to greater line loss with larger load, would, to a considerable extent, at least, be offset by increased efficiency of transformers. In view of these figures we hope you will feel warranted in indorsing the opinion that Niagara power *is now* being satisfactorily delivered in Buffalo.

One of the questions often asked is why this entire line was not placed under ground. One of the principal reasons was that the line of 12 wires, having a capacity of 20,000 horse-power, would cost, irrespective of right of way, fully $1,250,000 if under ground, and only about one-third that amount overhead, making a serious difference in interest charge.

Of such total costs, about 20 per cent would cover cost of conduit complete, including manholes, the remaining 80 per cent being lead-covered cables.

Of the overhead construction cost, slightly over 80 per cent is bare copper wire, less than 10 per cent covers poles set in place, and about three per cent covers insulators.

It is probable, therefore, that the depreciation of the lead-covered cables would greatly exceed that on pole line, the first cost being some 30 times as great, and the depreciation of the bare copper being negligible. Aside from this, experience to date has not demonstrated that the underground line would be more reliable, which alone could justify the increased depreciation and interest charge.

As a final deduction, it seems reasonably certain that it is now possible to build either overhead or underground transmission lines, even in regions subject to much cold, damp weather, capable of carrying current at 10,000 volts or higher pressure, which can be operated with efficiency and every assurance of uninterrupted service.

THE DISCUSSION.

Mr. Seely: Is it necessary to shut off the current when they replace their insulators?

Mr. White: Some insulators have been changed without shutting down. Where it has been tied in, unless on a very dry day, I should rather somebody else would attempt to replace the insulators with the current on. But I know of other 10,000-volt lines where it is done, and by having a large stool mounted on four porcelain insulators, on which a ladder can be placed, it will be entirely possible for a man to get up to the line and replace the insulator. The only trouble about that is that with 10,000 volts the capacity of a man is sufficient to absorb considerable spark, and if the man was nervous he might get shock enough to knock him off the ladder. So it is not a pleasant task, but it is entirely possible. We did replace a number of insulators where the wire had been tied, by lifting the wire on the top of another insulator which was mounted on a long stick, and then replacing the insulator and letting the wire come back into place.

Mr. Bean: Was it necessary to cut the trees for a certain distance on each side of the line?

Mr. White: It ought to be done, so that no trees falling can reach the line. Of course, that would make it absolutely safe. But from that limit up anything that can be done is determined by the cost of getting the right to cut down the trees, and would be advisable, certainly, 30 or 40 feet each side, and more if possible.

Mr. Seely: I presume time only will demonstrate the efficiency of the 30,000 or 40,000-volt tests applied to the insulators?

Mr. White: Yes, of course there are no data as to that. But the mere fact that not a single insulator has broken down during this time is pretty good evidence. With the other insulators, which were put up temporarily, the depreciation on the line was quite rapid, as mentioned in the paper. We used to have cross-arms burn off quite frequently, and that came from the fact that although these insulators had stood that 20,000-volt test, and there were only 10,000 on the line, yet enough rain would strike them to gradually moisten the porcelain, and, of course, as they absorbed this moisture the insulating properties would drop down to so small a value that they allowed the current to go through until it burned off the cross-arms from the arc that would form. That, of course, would break the contact, and the arc would stop of its own free will. In regard to these two insulators, I might say that probably the cause why this one (indicating) has stood more than the other is because it is a little stronger mechanically, and the three breaks were all due to some mechanical trouble, and it is probable that the difference is just due to that mechanical strain. The advantage that those have, carrying the rain over and letting it drop down to the side of the cross-arm, is, perhaps, of some value, although not as yet demonstrated to be of any great importance.

Mr. Dougherty: How many lightning arresters do they distribute?

Mr. White: The lightning arrester problem is still in the process of being solved, and it is largely in the experimental stage. There are very few of them on the line. The line is protected as much as we could from lightning by running two barbed fence wires on top of the poles, one carried on the outer cross-arm by an iron pin 18 inches long and one inch in diameter, which went through the cross-arm and had a little fork at the top supporting the barbed fence wire. A second similar wire was carried on the peak of the pole, the poles all being roofed, and a third is intended to be put up on the other side of the cross-arm when additional wires are put up. Every fifth pole these barbed fence wires are grounded, with a No. 6 copper wire running to the bottom of the pole and being coiled there, so that we can expect discharges will be carried off by these numerous points without accumulating sufficiently to give a lightning stroke. But the lightning arresters themselves are placed only at the transformer houses up to date, and those have given some trouble; so that probably none will be placed on the line until something has been put in the transformer houses that is perfectly satisfactory.

[*To be concluded.*]

RADIOGRAPHY.

The best phosphorescent screen is made of paper saturated with pentadecylparatatolylketone.—*The American X-Ray Journal.*

The X rays have shown that the tibia and femur in Justice Stephen J. Field's knee have almost grown together, and that the hinge has partially solidified.—*St. Louis Post-Dispatch.*

It is probably true that the life of President Garfield would have been saved if the Roentgen rays had been known in 1881. No difficulty now is found in locating a bullet distinctly in the deepest recesses of the body.—*St. Louis Globe-Democrat.*

In a hospital at Florence a patient was submitted to the X rays, when, to the astonishment of the operators, it was discovered that his heart was on the right side instead of the left. This did not appear to trouble the patient in any way. It may be remembered that Picchianti, the noted scientist, also had his heart on the right side, and that he died at 64 years of age without ever having been seriously ill.—*The American X-Ray Journal.*

Mr. Jenney May Establish a Plant in Detroit.

Mr. Charles D. Jenney, whose electrical manufacturing plant at Indianapolis was burned out a few months ago, is reported to be willing to re-establish his business in Detroit, provided the citizens of that place will subscribe $15,000 to the stock of his company. It is said that he may try to secure the old Detroit motor works, and will employ from 100 to 200 men.

Mr. Heinrichs on the Improvement in Business.

Mr. E. H. Heinrichs, of Pittsburgh, the well known advertising manager for the Westinghouse Electric and Manufacturing Company, was interviewed last week by the Pittsburgh *Leader* on the return of business prosperity. An abstract of his observations follows:

"There are, undoubtedly, many indications that business is reviving, and that the advance agent of prosperity is keeping his promise, although the effects have been slow in coming. A number of business men with whom I have spoken on the subject, assure me that the number of inquiries in their trade which they have received lately, has considerably increased. I was at the convention of the electric lighting men of this country, held at Niagara Falls only a week ago, and it was evident by the spirit of activity and encouragement which was shown by the delegates to that meeting that they felt that times were going to be better. But I have another way of telling me that the wave to prosperity has at last arrived, and to me that is an infallible indication. I am referring to the publications that are issued throughout this country in the interest of science, trade and industry. As you are probably aware, we receive in this office over 100 different publications from every part of the United States and Canada, representing different branches of industry, such as iron, steel, coal, electricity, engineering papers, railway papers, mining papers, etc., etc. It is the business of this department to study these papers very closely, and that part containing the advertisements of these journals is of special interest to us. I have noticed during the last four weeks that the number of advertisements in these papers have considerably increased, and the papers are much 'bulkier' than they used to be. These additional number of advertisements show that business men have gained more confidence in the prospects of their line, and for that reason are willing to invest money in advertising in order to obtain some of the new business that appears to be had."

Receiver for the Wenstrom Company.

Mr. Christopher C. Shriver, a stockholder, has filed a petition in the Circuit Court, at Baltimore, Md., asking that a receiver be appointed for the property of the Wenstrom Electric Company, of Baltimore. Judge Dennis signed an order to show cause why a receiver should not be appointed. It is alleged that the affairs of the corporation were mismanaged, and that the property is now abandoned and going to ruin.

KIND WORDS.

"KEEPS AHEAD OF THE PROCESSION."

To the Editor of Electrical Review:

The Electrical Review keeps ahead of the procession, I notice. It is simply fine these days.

Frank B. Knight.

Austin, Tex., June 17.

DELIVERY OF COMMERCIAL TELEGRAMS AT RAILWAY STATIONS.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, NIAGARA FALLS, JUNE 16, 1897, BY L. H. KORTY.

One of the most important duties at a railroad station where commercial telegrams are handled, is the prompt and proper delivery of such messages, and yet most of you, no doubt, have often been vexed by cases of failure and neglect of this duty coming to your attention.

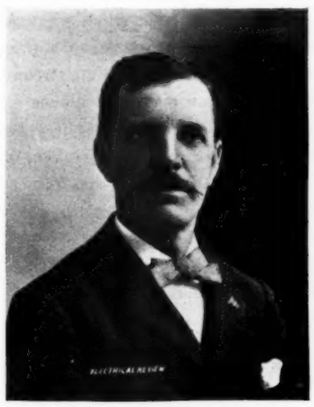
Delays in the transmission of telegrams at railroad offices are far less frequent than in their delivery. There are many operators who seem to consider the prompt transmission the only essential requirement, and who will contend for circuit to a degree beyond the limit of the rules in order to rush a message and get rid of it, but who will delay the delivery of a received message with the utmost indifference, and often, to make matters worse, when finally delivered, no receipt is taken or time of delivery noted. This latter neglect is also quite common at some stations, as is also the failure to note, in proper places, the different degrees of service from time of filing up to that of delivery. Some operators, although carefully marking the time a message is sent, fail to show the time it was filed, thus leaving uncertain the time of delay at the originating office in case complaint is made.

Some agents who would not think of delivering a shipment consisting of scrap iron, an old horse collar or any old thing without taking an iron-clad receipt, will deliver commercial telegrams involving thousands of dollars without any kind of a record of the transaction, and when asked to produce receipt for a lost message will tell you that they did not know it was necessary to take receipts for commercial messages. The chief "griever" of the Order of Railroad Telegraphers on the Union Pacific System gave this excuse recently when asked to show delivery of a certain Western Union telegram, and this man has had many years' experience as an operator and agent, and, from the fact of his occupying an important position in the Order, is regarded by his fellow employés as a man well up in the duties of his profession.

Some patrons of the telegraph are so apprehensive about the delivery of their messages that they prefer to send them "collect," under the impression that if charges are to be paid at destination the operator is more apt to give the delivery better attention than he otherwise would.

The telegraph company's rules on this and other subjects are clear enough, but the average agent and operator does not familiarize himself with them. He often gets his training at a station where the commercial telegraph business is a secondary matter and where the rules governing this business are not followed. Such a man is the bane of the railway telegraph superintendent in charge of the commercial telegraphing of his road.

Many telegrams are received at stations addressed to passengers on trains. These must necessarily be given to the train conductor to find the party. The conductor may be unable to give it personal attention and turns it over to the brakesman to find the owner; but "Brakesy," in his anxiety to resume his seat with the lady passenger whom he is entertaining, does not make a thorough search through the train, puts the message in his pocket and the matter is forgotten until the usual claim for damages on account of non-delivery is received. Investigation proves but one thing; namely, that the message was received at the station, but nothing further is on record. The operator claims he turned it over to the conductor of the train, but has nothing to show for it, as he failed to take his receipt. The conductor disclaims all knowledge of it. Asked why he does not take receipts for commercial messages delivered, the agent in this case may reply that he does take receipts from everybody except conductors, who usually decline to receipt and be responsible for telegrams for parties on trains. Under these conditions there is no certainty that a message will ever



MR. J. W. LATTIG, PRESIDENT OF THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.

reach the owner, or, in case of failure to find him, that the sending office will be notified of non-delivery.

Most of the irregularities in delivery service exist at the smaller offices, where there is no messenger and not sufficient business to justify the employment of one, the agent performing all the various duties of the station, including delivery of telegrams; and as station employés too often look upon the commercial telegraph business as an outside matter, imposing upon them duties for which they receive no compensation, this branch of the service is most likely to suffer and be subject entirely to their personal convenience; yet the telegrams received at these thousands of small railroad offices constitute a considerable portion of the whole telegraph business of the country, and therefore justly demands our careful attention and individual efforts to improve. Although a railroad company may not share directly in the telegraph earnings, it is compensated in one way or another through its arrangements with telegraph company, and, aside from the contract obligations to properly handle the telegraph business at stations, there is a moral obligation on the part of the railroad company toward communities and patrons who are dependent upon its employés for this important service.

An agent charged up with the tolls on a message delayed or lost through his negligence generally profits by the experience and is thereafter usually more watchful of this business; but we should not wait for our employés to be educated in their duties by this means. The paltry amount of tolls refunded to the claimant does not entirely appease his feelings, and he will always entertain a lack of confidence in our telegraph service, as well as the service in general at railroad stations.

How best to accomplish an improvement in this service is a question. I have, through special instructions at various times, reminded all concerned in my jurisdiction of the necessity of prompt and proper deliveries in accordance with the rules, but any improvement resulting therefrom has been only temporary, on account of so many changes, and new comers to break in, and I find that, although some start in to take receipts for deliveries, they are apt, after a time, to conclude that it is an unnecessary duty and abandon it. I have recently commenced another plan which I believe will prove more successful if kept up, and that is to frequently call for delivery sheets from all offices for a certain month to be sent in with monthly reports for the purpose of examining the same and to check them up with the number of messages reported delivered on Western Union Form 41. By this plan the offices that fail to keep up their delivery sheets can be discovered, which alone will be of considerable value to the superintendent, even if he does not take the time to check them up to see if any entries are omitted. I don't know but what it would be a good plan to have all delivery sheets sent in with each monthly report and filed in the superintendent's office.

In order to get the train conductors into line in regard to delivery of messages for parties on trains, we invoked the aid of the general manager, who issued a circular on the subject as follows:

"1. Conductors will receipt to operators for all commercial telegrams handed them for delivery on trains.

"2. Due effort must be made to find parties addressed and receipts taken for such telegrams on form supplied for that purpose, first writing thereon party's address and time of delivery.

"3. If party can not be found, notice must be wired to receiving office from the next stop.

"4. If any charges are to be collected on telegrams, the same must be paid over to the receiving office as soon as possible. In case a party decline to pay charges, telegram may be delivered, but notice of such refusal must be wired to receiving office.

"5. Blank form of receipts are to be pasted on inside of conductor's report book, Forms 2638 and 2639. These receipts must be preserved as evidence of proper delivery in case complaint is made. Future supplies of conductors' report books will have blank receipts for telegrams printed therein."

This circular was issued two and a half years ago, and since that time there has not been a failure of a commercial message reaching a passenger on the Union Pacific system.

(Copies of conductors' report books, containing form of receipts, and the general manager's circular were shown.)

In *McClure's Magazine* for July, the late Professor Drummond is the subject of a paper by the Rev. D. M. Ross, who lived in close intimacy with him from his boyhood to the hour of his death, and who is thereby enabled to give us the first really vivid and satisfactory presentation we have had of a man who was one of the great personal influences of his time. The paper is illustrated with several portraits of Professor Drummond, one of them a recent one, which his friends consider the best in existence.

Mr. J. W. Lattig.

The new president of the Association of Railway Telegraph Superintendents, Mr. J. W. Lattig, who was elected at the convention held at Niagara Falls, N. Y., on June 16, 1897, was born on May 14, 1854, at Easton, Pa., and resided there until 1864, when he removed to Delano, Pa. Here he attended the common schools until 12 years of age, when he entered the employ of the Lehigh Valley Railroad in 1866 as water boy on a gravel train. Later, he became a messenger and office boy, and learned to telegraph, first by paper and then by sound. Soon afterwards he was made an operator in the train dispatcher's office at that point. Mr. Lattig resigned this position and served one year as a machinist's apprentice, quitting this, at the solicitation of friends, to re-engage in the telegraph field.

In 1873 he was appointed a dispatcher, but resigned to accept a position as assistant agent and operator, at Tunkhannock, Pa. He was transferred to the dispatcher's office, at Towanda, Pa., in 1874, and to the general superintendent's office, at Bethlehem, Pa., as night operator in the same year. In 1877 he was made division operator at Mauch Chunk, Pa. In 1879 he was appointed superintendent of telegraph.

Mr. Lattig resigned in 1890 and became general superintendent of the National Switch and Signal Company, at Easton, Pa. In 1891 he was appointed general superintendent of the Electric Selector and Signal Company, of New York city, and in 1892 became the electrical engineer of the National Switch and Signal Company, at Easton, Pa.

In 1893 Mr. Lattig returned to the Lehigh Valley Railroad as superintendent of telegraph and signals, having direct charge of electrical appliances of every kind, from automatic electric railroad signals, of which the company has 500, to electric lights and plants, electric elevators, telephones and power applications, in addition to a list of 450 employés, including telegraph operators, linemen, signal men, etc.

Mr. Lattig has invented a number of electrical appliances, including an automatic electric semaphore signal for railroads, and an electrically illuminated semaphore signal.

Business Signs.

TO THE EDITOR OF ELECTRICAL REVIEW:

Business is better.

W. S. Hill Electric Company,
CHARLES S. MENDELL,
Treasurer.

New Bedford, Mass., June 25.

The very successful group of college articles in *Scribner's Magazine* is concluded with Judge Henry E. Howland's account of "Undergraduate Life at Yale" in the July issue. Judge Howland has kept in close touch with Yale life from 1850 to the present day, and his article is the very cream of nearly half a century of reminiscences and anecdotes.

Electrical Review

Times Building, 41 Park Row,

P. O. Box 2339. NEW YORK.

EDITOR:
CHARLES W. PRICE.

ASSOCIATE EDITOR:
STEPHEN L. COLES.

REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.

1846 "CORTLANDT," TELEPHONE CALL.

WESTERN OFFICE:
CARL E. KAMMEYER, Representative,
1627 MONADNOCK BLOCK, CHICAGO.

LONDON OFFICE:
HENRY W. HALL, Representative,
42 OLD BROAD STREET, LONDON, E. C.

News, Subscriptions and Advertisements.

Subscription to the
ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy, - - - - - - .10

Copies can only be supplied for one year back at 25 cents each.

NEW YORK, JULY 7, 1897.

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The Memphis Electric Light and Power Company has caught two saloon-keepers stealing current from its lines by means of choking the meters so that the registering mechanism was rendered useless. The company removed its wires and lamps from the two saloons, and its attorney is now hunting up the Tennessee statutes to see whether or not the company can begin a criminal prosecution of the two saloon men.

Mr. L. H. Korty's paper on "Delivery of Commercial Telegrams at Railway Stations," published on another page, may contain some suggestions for the electric railway manager, who, in the future, will probably have to meet the problem considered by Mr. Korty.

They do some things better in France, but the lexicographers of that country have recently created two words of wonderful hideousness. A vehicle propelled by power obtained from accumulators is now called an "accumobile." The horse is not called a *cheval*, but is now spoken of as a "hippomotor."

Electricity has invaded the egg business. The Egg Candlers' or Egg Testers' Union in New York city has been reorganized under the name of the Independent Egg Inspectors' Union. It is said that wholesale dealers in eggs are very much afraid of the testers as they are extremely expert and can read at a glance the physical state of the most deceptive egg. The reason given for changing the name of the union is that formerly eggs were tested by holding them between the eye and a lighted candle. The electric lamp has superseded the candle in this as well as many other fields.

A Western contemporary asserts that Dr. Jordan, of Leland Stanford University, purposes taking to Alaska an electrical outfit for the purpose of branding seals. A machine was invented by Instructor Farmer, and has been tested on the university cats with satisfactory results. It is stated that Dr. Jordan will take along with him four embryo electrical engineers, in order to operate the machine. Two will turn the handle and the others will hold the seal. It is understood that a course in electrical seal branding is to be established in the engineering department at Leland Stanford University.

Mr. Justus C. Strawbridge has presented to the city of Philadelphia a $10,000 statue of Benjamin Franklin, to be erected in front of the Post Office in that city. It was on this historic spot that the great philosopher flew his kite and attracted the lightning from the skies. On the same spot he afterward laid the cornerstone of the old University of Pennsylvania buildings. The statue is to be of heroic size and represents Franklin seated on a colonial chair. The electrical fraternity at large owes to Mr. Strawbridge a debt of gratitude for this tribute to Franklin and for marking this historic spot in such a fitting manner.

A. A. A. S.

The next meeting of the American Association for the Advancement of Science will be held at Detroit, Mich., from August 9 to 14, and promises to be very interesting. Papers are to be presented from the University of Michigan, Johns Hopkins University, Massachusetts Institute of Technology, Cornell University, Princeton University, Lehigh University, and from many of the most important laboratories in the United States. Many distinguished physicists and electricians have expressed their intention to attend this meeting and to take part in the discussion of the many important and interesting papers to be presented. The British Association for the Advancement of Science meets on August 18 at Toronto, and a number of its members have already signified their intention of being present at Detroit and taking part in the proceedings of the physics section. The programme is particularly strong in electrical papers, especially those dealing with alternating currents, and contains the names of Mr. Steinmetz and Mr. Brush, in addition to those who occupy university or college positions.

Some interesting experiments are being carried on by the Carnegie Steel Company at its Homestead works in heating steel billets by electricity. The advantages said to have been achieved, are economy in fuel, a saving in time required to heat the billet, and also that the billets are heated from the center to the outer surface, insuring equal heat throughout the mass. This last is said to be of prime importance. The steel thus treated is reported to be of better quality, from the fact that the exact temperature required may be obtained without overheating. It is said that billets up to 12 inches in length, have been successfully treated in this manner. The president of the company, Mr. C. M. Schwab, who is the originator of this new method, hopes to develop it to a still greater extent.

An encouraging sign of the times is to be observed in the statement that the business done in June of this year by the largest storage battery company in the United States is double that done in June, 1896. This not only means that the storage battery is rapidly mounting towards its proper place among the most important electrical apparatus, but it also shows that the operating and commercial divisions of the electrical business are in a better financial position than they were a year ago.

PERSONAL.

Mr. O. T. Crosby, of Washington, D. C., visited New York city last week.

Mr. H. J. Medbery, of the Fiberite Company, Mechanicsville, N. Y., was among the visitors to New York city last week.

Mr. A. G. Davis, president of the Viaduct Manufacturing Company, Baltimore, left on June 30 for his Summer home at Lake George.

Mr. Marsden J. Perry, president of the Narragansett Electric Light Company, of Providence, R. I., was among the visitors to New York city last week.

Mr. G. Herbert Condict, receiver of the Englewood & Chicago Electric Railway, was called to New York last week by the sudden illness of his little daughter.

Mr. H. L. Shippy, secretary of the John A. Roebling's Sons Company, was among the electrical witnesses of the Queen's Jubilee in London last week.

President Samuel Insull, of the National Electric Light Association, came on from Chicago last week to consult with Vice-President Young and Secretary Porter on association matters.

Mr. J. O. McRyder has resigned his position as secretary and treasurer of the Crown Woven Wire Brush Company, of Salem, Mass., and informs the ELECTRICAL REVIEW that he has no further interest in the company.

Mr. W. R. Mason, of Chicago, well known in electrical circles, has just been appointed selling agent for the State of Missouri for the Walker Company, of Cleveland, Ohio, and will make his headquarters at St. Louis. Mutual congratulations are in order.

Mr. Henry Hine, of Pittsfield, Mass., general manager of the Stanley Electric Manufacturing Company, was a New York visitor last week, accompanied by his wife, and made his headquarters at the Waldorf. Mr. Hine's ably-managed company is very busy at the present time filling several large contracts; in fact, the hard times of the past three or four years seem to have missed the Stanley company, which has been continually busy.

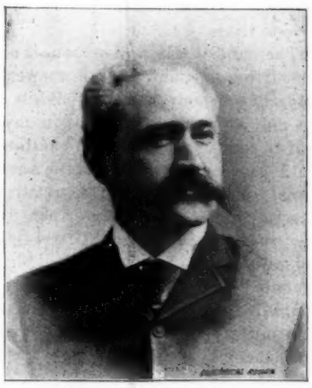
Mr. Edw. Lyman Brown has been appointed assistant treasurer of the Bibber-White company, Boston. Although Mr. Brown is new to the electrical field he has had considerable business experience, chiefly in State street, Boston. He is a native Bostonian and comes from one of the oldest and best known Massachusetts families. He received his college education at the Massachusetts Institute of Technology, and, consequently, the acquirement of the technical knowledge necessary in his new position will come easily to him. The Bibber-White Company is one of the most flourishing electrical firms in the East, and of late has been doing a large business, especially in electric railroad construction. The ELECTRICAL REVIEW congratulates both the company and Mr. Brown on his new connection.

Another Large Contract For Westinghouse.

Although it is only a week since the Westinghouse Electric and Manufacturing Company obtained the contract for fifteen 5,000 horse-power generators from the St. Lawrence Construction Company, of New York, a few days ago they secured a contract from the Boston Terminal Company, which is now constructing the Southern Union depot at Boston, Mass. This depot will not only handle the largest number of trains entering any station in the world, but will handle them in the most complete and efficient manner. All the modern devices of interior motive power for heat, light, electric power, signaling, elevator work, refrigeration, ventilation, etc., will be taken advantage of in the equipment of this gigantic undertaking.

Regarding this contract, president Charles P. Clark, of the New York, New Haven & Hartford Railroad, says:

"We awarded the contract to the Westinghouse companies because they are the only concerns that could cover the whole field. Any subdivision for the engineering or construction the company will attend to, and thus it should be able to connect and centralize all the heat, light and power economically. We expect to be in the new Union station in 1898." It is understood this contract amounts to over half a million dollars.



EUGENE EFFINGHAM BOGART.

E. E. Bogart.

The ELECTRICAL REVIEW presents on this page a portrait of Mr. E. E. Bogart, whose death in New York city on June 24 was mentioned in last week's REVIEW. Mr. Bogart was especially well known in the field of electric gas lighting apparatus and succeeded his father, the late A. L. Bogart, in the business which is still carried on under his name in Union square, New York city. In his special line of business Mr. Bogart was very well known and was an extremely popular gentleman. His death was the result of injuries received in a cable-car accident a few months ago, and comes as a great shock to his family and friends. He leaves a widow and three children.

Dr. Allan V. Garratt, chief engineer of the Lombard Water Wheel Governor Company, of Boston, was among the out-of-town visitors to New York city last week.

CONVENTION ECHOES.

ADDITIONAL DETAILS FROM DETROIT.

Mr. M. Garl, of the Garl Electric Company, Akron, Ohio, was present, and shook hands with many customers who had used the company's instruments.

The Allen-Hussey company, one of Chicago's prominent telephone and electric construction companies, had Mr. A. R. Hussey in attendance, who ably guarded his company's interests.

Armorite conduit, although not as yet used to any great extent in telephone work, seems, nevertheless, to be well known to the trade, as was found by Mr. J. F. Cummings, the inventor, who happened to be in Detroit and attended the meeting.

W. S. Eckert, of the Bi-Metallic Electric Transmission Company, New York, showed samples of the company's bi-metallic wire, and found apparently little trouble in convincing exchange managers of its good points, especially for long-distance transmission.

Mr. F. S. Viele, probably one of the most enthusiastic as well as energetic gentlemen connected with underground work, was present, and explained why the products of the Standard Underground Cable Company give such unqualified satisfaction wherever used.

Smith & Patterson, New York, who are exploiting the Ericsson Swedish telephones in the United States, gave a practical demonstration of the working of the Ericsson instruments by having a line run from the hotel office to a room, where a young lady gave "exhibition talks" to all who desired to test the efficiency of the instruments.

Connecticut Telephone and Electric Company, Meriden, Ct., through Mr. E. C. Wilcox, of the home office, and Mr. F. F. Sapp, the company's energetic Chicago manager, took good care that all delegates and exchange managers became thoroughly familiar with the good features of the company's latest rapid and simple switchboard.

The Farr Telephone and Construction Supply Company, of Chicago, were ably represented by Mr. R. J. Cram, the company's secretary and treasurer, who makes his home in Detroit. Mr. Cram was somewhat disappointed over the stand taken by the association as regards manufacturers, and did not join the latter organization.

The National Carbon Company's exhibit of battery cells and carbon specialties was in charge of Messrs. John Rice and Richard O'Connor, who were kept busy explaining the various products made of carbon. A complete line of the National No. 2 depolarizing batteries attracted particular attention, as did the new form of granular transmitter carbon, which, by a new process, is polished so that it will not pack.

The Nungesser Electric Battery Company, of Cleveland, through its Mr. P. P. Nungesser, called attention to the many advantages of the company's closed-circuit batteries, especially for switchboard work, where constant current is so important. The good points of the Nungesser batteries are fast becoming known to the telephone interests, where, as in all businesses, the best is the most economical in the end.

President H. A. Taylor and general superintendent J. J. Nate, of the Standard Telephone and Electric Manufacturing Company, Madison, Wis., were among the most prominent delegates, and it is doubtlessly true that largely through their energy and diplomacy an independent organization of manufacturers was finally perfected. Mr. Nate's thorough knowledge of the telephone patent situation proving of especial value during the preliminary meetings.

Changes in Chicago Telephone Circles.

Quite a bit of surprise was created in telephone and financial circles at Chicago last week, when it was announced that Henry B. Stone, president of the Chicago and of the Central Union Telephone companies, had resigned. The fact that the Central Union Company has been more than usually active of late in extending its lines and securing new subscribers, and that its lines, exchanges and service generally are in the best possible condition to render perfect long-distance service to the public, led many to conclude that only ill-health could have induced Mr. Stone to resign at a time when the two companies are in such excellent condition. Such, however, is not the case, as Mr. Stone is enjoying good health, and states that he is not prepared at present to make public any particular reason for his leaving. As soon as possible after July 1, the day his resignation went into effect, Mr. Stone will leave on an extended trip through Europe, accompanied by his family. How long he will be away depends upon how enjoyable the trip proves, and on his return Mr. Stone will engage in other ventures than the telephone business. What this other business will be, Mr. Stone says he is not prepared as yet to state to the public.

In order to fill the two vacancies caused by Mr. Stone's resignation, both companies held a directors' meeting on the 28th ultimo, resulting in the election of Robert T. Lincoln as president, pro tem., of the Chicago Telephone Company, with all the powers of the office, to take effect on July 1. The Central Union Telephone Company elected Mr. W. A. Jackson president, who heretofore had been vice-president and general manager of the company, and who, in his new position, will no doubt be able to still further improve the excellent service the company has been giving. Mr. Robert T. Lincoln, who has been appointed to fill the office of the president for the Chicago Telephone Company, pending the election of a new president, is a gentleman so able and prominent, not only in electrical circles but in national affairs as well, as to make any detailed mention of him unnecessary. The indications point strongly to his election, at the proper time, to the high office, the duties of which he has already entered upon.

WHY SOME LIGHTING PLANTS DO NOT PAY.

READ BEFORE THE CANADIAN ELECTRICAL ASSOCIATION, NIAGARA FALLS, ONT., JUNE 2, 1897, BY F. C. ARMSTRONG.

Before proceeding to a discussion of the subject proper of this paper, it is necessary to fix a standard by which it may be determined whether a given plant is paying or not. A fair definition, taking everything into consideration, would seem to be that a plant which earns 12 per cent per annum or over on the capital investment, which, at present prices of apparatus and material, would be required to provide an equipment of equivalent earning power, should be considered as a paying investment. In this definition we imply that six per cent net per annum is a fair return for money invested in an enterprise of this nature; that six per cent per annum is, under present and prospective conditions, a reasonable and sufficient allowance for depreciation; and that the capitalization upon which these charges are made should suffer the material and arbitrary reduction necessary to bring it down to the basis of present selling prices of electrical equipment Regarding the first of these postulates, a strongly affirmative view may be taken. Electric lighting has established a reason for being, beyond question, amongst modern industrial enterprises. Abundant artificial illumination for safety, need or convenience has become an indispensable requirement of our present multiplex civilization. The electric light supplies this necessity, it is safe to say, in spite of Welsbach burners or acetylene gas, more completely than any present or, as far as we can see, any possible competitor. The central station is a shining example of the sound economic principle of concentration of production and diffusion of output, which means commercially that under most circumstances it is cheaper to get your light from a central station than to install an isolated plant. It may, therefore, fairly I think be conceded that, whatever may have been the vicissitudes of the past, the money invested in a central station to-day is entitled to take rank as a safe, conservative and first-class investment from which a return of six per cent per annum should be regarded with satisfaction.

The sufficiency of the allowance of six per cent to cover depreciation is more open to discussion and in it is really involved, as well, the soundness of the third assumption. In order to clear the way to a fair consideration of this matter it must be kept in mind that the depreciation of electrical apparatus in the past, and to a measurable degree in the future, is of two distinct kinds. The first is in the depreciation proper, due to the wearing out of the machinery and appliances in service; the second, and in the early days of the electrical art vastly the most important, is the arbitrary depreciation which is due not to the wearing out of the plant, but to its becoming obsolete by reason of the introduction of newer and more efficient and satisfactory types. There can be no question but that the unparalleled rapidity of development of electrical science and the electrical industry, which has crowded the progress of a century within one decade and a half, has borne heavily upon the earlier investors, whose faith and courage made this marvelous progress possible. The apparatus produced in the tentative stages of electrical evolution was naturally crude and often unsuitable for the purpose for which it was sold, since the principles governing its operation were only dimly understood or guessed at, and that often incorrectly. Considered in the light of present standards the units in use were, in view of subsequent requirements, absurdly small; the commercial efficiency of generators, distribution lines and transformers when used was very low; regulation, with all which it entails in plant efficiency, was practically non-existent. The steam plant on the market, too, was in a much less advanced stage of development than at present, and the relative suitability of varying types had as yet to be determined. Contrasting with this the present condition of the art, we find that in the best types but little room is left for improvement along present lines. The efficiency of the best dynamos of to-day is exceedingly high, 90 per cent or better at full load being an ordinary guarantee for even the smaller sizes. Regulation in the best machines, both for incandescent and arc lighting, is practically perfect. As an example of the stability to which the highest grades of apparatus have attained by a gradual course of evolution, we may instance a widely known machine—the ironclad armature type of alternator, as constructed by a number of the principal manufacturing companies. Experience has established its perfect adaptation to the purpose for which it is primarily intended—the supply of alternating currents for incandescent lighting. Its design renders possible the highest attainable efficiency at all loads; the regulation by the simple device of compounding provides compensation not only for armature reaction, but also for line and transformer drop, insuring an even potential at the lamps, and permitting the use of lamps of 10, 20, or 30 per cent higher efficiency than was possible with hand regulation. The ironclad construction of the armature secures perfect mechanical protection of the conductors buried in the slots, and these are made easily removable for repairs in case of damage. The high self-induction caused by burying the coils beneath the iron of the armature affords the best possible protection against burn-outs by lighting or short circuit. The single phase system for which these machines are designed is admittedly the simplest and most economical for lighting distribution. Altogether, therefore, it is evident that this machine, which is selected simply as a familiar type, has proved itself in experience to be admirably adapted for the work which it is called on to perform.

Setting aside all unessential peculiarities in design, by which one or another machine or appliance may be recommended as against that of a competing manufacturer, there can be no question that for both incandescent and arc lighting the best types to-day are practically perfected for the work which they are called on to do, and have therefore reached a reasonably permanent and stable form. This being the case, the arbitrary depreciation charges to which an investment in electric lighting plant was formerly subjected are no longer to be feared, and that the depreciation due to the natural wearing out of the machinery in service is covered by the allowance made for that purpose, no one will probably be inclined to dispute. In the matter of current prices, whilst improved methods of manufacturing and the keenness of competition may be expected to cause from time to time some further reductions, the bottom may fairly be said to have been touched in most lines of standard supplies and machinery.

(To be continued.)

THE RELAY AND ITS RELATION TO THE TELEGRAPHIC CIRCUIT.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, NIAGARA FALLS, JUNE 16, 1897, BY THOMAS D. LOCKWOOD.

In 1896 I was most unfortunate in that I was not able to be present at the annual meeting of the association, whose honorary membership I consider to be one of the most estimable and valuable rewards which, in my professional career, I have had the privilege of receiving.

As is usually the case, the several papers presented there were all valuable, useful and intensely practical. But the telegraphic periodicals which came before me spoke of a particular one in such terms as to inspire me with a good deal of interest and curiosity, which in due season I was, by the arrival of the published proceedings, enabled to gratify. This particular paper was that offered by Mr. U. J. Fry, on "Reduction of Relay Resistance," and as soon as I had the opportunity I read it over several times.

The subject was well chosen, is an ever-living one, and I think was very happily and ably handled. While I do not, of course, take it upon myself to compare the paper in question with the others presented at the same time, or to discuss its relative merits, I do feel called upon to say that it was one which strongly appealed to me; and I was gratified to note that, judging from the preamble to the resolution advocating a continuance of the experiments by a special committee, it was highly appreciated by the members present.

I was, in fact, so rejoiced at seeing the subject under consideration that I took the liberty of corresponding with Mr. Fry about it; and after the exchange of a few letters, and after he had kindly sent me copies of the *Telegraph Age*, discussing the question, apropos of his paper, I intimated to him that, unless he considered by so doing I should be trespassing on his territory, I was disposed myself to follow his paper up by preparing one myself for this meeting—if I were requested to prepare any at all.

I am bound to say that he kindly and frankly encouraged me to proceed, and as a consequence this paper is now inflicted upon the association.

The telegraph relay is, of course, an electro-magnetically operated key, controlling a short local circuit containing the electro-magnetic helices of a sounder, and having its own electro-magnetic coils adapted to be placed in the circuit of the main line. The armature portion of the main line or relay electro-magnet has a lever which is poised in trunnions or pivots in close proximity to the poles of the horseshoe or fixed portion of the iron core, and these, on the passage of a current through the coils, tend to pull the armature closer to them, against the power of a counter spring, which, as soon as the current ceases, pulls it back. The armature lever is in the local circuit, and at its free end carries a little platinum point, which, when the lever is attracted, strikes a front stop of platinum which forms the other end of the local circuit, and thus closes that circuit, enabling the current of the local battery to flow through it, and through the magnetizing coils of the sounder, which thus becomes operative and gives the audible signal required.

But the armature lever has also a back limit stop, which is insulated or non-conducting, and when the main-line circuit is opened, or when from any cause the current through the relay coils ceases to flow, or flows too weakly, the counter spring becomes stronger than the magnetic attraction, and the armature is consequently pulled back by it, the end of its lever separating from the conducting front stop and receding until it strikes the non-conducting back limit stop, thereby opening the local circuit.

Let us disregard for the moment that function of the instrument which gives it the name of "relay," and let us consider it merely as an electro-magnet; remembering that such term either expresses or implies an armature also.

The electro-magnet was originally invented in 1824 by Sturgeon, who wound a U-shaped iron core, varnished to give it an insulating surface, with one layer of bare wire. He had, of course, to keep his turns pretty far apart, so that they would not make contact with each other, and thus cut out more or less of the winding; and we are apt to think the device a rather crude affair.

We must not, however, forget that it was the first of its race; and from that point of view it was a wonderful improvement, and it worked.

(To be continued.)

The Reis Transmitter.

TO THE EDITOR OF ELECTRICAL REVIEW:

In view of the controversy which is pending in regard to the telephone situation, I thought it might be of some interest to you or some of your readers to know of a few experiments which were part of a large number conducted along this line to test the practicability of the Reis transmitter.

In 1883 I assisted Prof. A. E. Dolbear in his laboratory in making some tests to establish the fact that the transmitter, as described and constructed by Phillip Reis about 1866, would, when properly adjusted, transmit speech.

This it did, and did it very well. The knowledge of this fact made it seem very strange to me that a patent should be granted at so recent a date as 1891, upon the principle of the variable contact in a transmitter.

Being one of your constant readers, I take great interest in what you say on telephone matters.

Very truly yours,

JAMES H. CARY.

Springfield, Mass., June 22.

We have received from Prof. George D. Shepardson the catalogue for 1896–7, of the University of Minnesota, containing the announcements for 1897–8.

ELECTRIC LIGHT FLASHES.

Mannington, W. Va., is to have a new electric light plant with a capacity of 1,200 lights, to be built at a cost of $10,000.

The Boston Electric Light Company has declared its regular quarterly dividend of one and one-half per cent, payable July 15. Books closed June 30 and reopen July 16.

The Edison Electric Illuminating Company of New York has declared a dividend of one and one-half per cent, payable August 2. Books close July 10 and reopen August 3.

The stockholders of the Manchester, N. H., Electric Light Company have voted to authorize the directors to issue five per cent bonds to an amount not exceeding $250,000, to retire $80,000 six per cent bonds and pay for extensive improvements.

William E. English has closed a contract with the Commercial Electric Company, of Indianapolis, Ind., for the electric lighting plant for the new opera house. This plant, when completed, will be the largest private electric lighting plant in the State.

The directors of the Skowhegan, Me., Electric Light Company have purchased the mill property and water-power, formerly owned by L. W. Weston & Company, for $40,000. The power will be developed and the power-house thoroughly equipped with the latest machinery. Both steam and water will be utilized, thus providing excellent service at all times.

At a special meeting of the stockholders of the Manchester, N. H., Electric Light Company, a vote was unanimously passed authorizing the directors to issue bonds to an extent not exceeding $250,000 at not exceeding five per cent, to retire $80,000 of six per cent bonds now outstanding, and pay for extensive improvements and additions recently made and in contemplation.

The jury in the case of Thomas Bell against the Cleveland, Ohio, General Illuminating Company, for $50,000 for injuries, returned a verdict a few days ago for $4,500 for the plaintiff. The jury was out over four days. Mr. Bell was crippled for life while heroically attempting to save the life of a girl who had been caught by a live wire on the Wright House.

A certificate of proceedings of a meeting of the Palmyra, N. Y., Electric Light and Power Company has been filed in the County Clerk's office. The certificate shows that the company has increased its capital stock from $10,000 to $30,000. The additional $20,000 of stock is to be divided into 400 shares of preferred stock, the holders of which are to receive an annual dividend of six per cent.

A certificate has been filed with the Secretary of State by the Flushing, L. I., Light and Power Company, setting forth that its capital stock has been increased from $30,000 to $100,000, and that the value of its shares has been increased from $10 to $100 each. The company's debts and liabilities are placed at $28,148. Among its directors are George Pople, S. E. Morrow, D. Master, Joseph Dykes, George W. Pople and Samuel McCreery.

The Shadowless Arc Lamp.

The Fessenden Manufacturing Company, of Pittsburgh, is introducing a new form of arc lamp, which is called the "Shadowless." Two views of the lamp are presented on this page. The arc being horizontal, throws the light down and in every direction. There are no shadows anywhere, on ceiling, floor or walls. The light is very evenly distributed, though more light is thrown downwards than up, as is, of course, desirable. The difference is not enough to be noticeable except when attention is called to it.

TWO FORMS OF THE SHADOWLESS ARC LAMP.

The shadows, instead of being harsh, are very soft, due to the even diffusion, and a hand held one foot from a sheet of paper will throw no shadow. The quality of the light is said to be the closest approximation to daylight yet produced. After a pair of carbons are put in, the manufacturers announce that no attention of any kind is required for two weeks, when burning five hours a day. The cost of carbons, labor and trouble are reduced to a minimum.

The small size of these lamps is a special feature, and they are made for both direct and alternating current. Ornamental lamps of many styles are manufactured. One of these, inclosed in holophane globe, is shown.

The Fessenden company can, for special work, furnish lamps to burn for 400 hours, the height of the lamp and globe being only 18 inches. They do not, however, recommend such lamps, believing that a lamp should be inspected at least once a week.

Activity of Westinghouse Factories at East Pittsburgh.

No more healthful sign of assured business improvement could be found than by a visit to the shops of the Westinghouse industries at East Pittsburgh and vicinity. A representative of the ELECTRICAL REVIEW was shown through the plants of the Westinghouse interests a few days ago, and in every department of the large electrical buildings almost the full complement of men were at work with every indication of renewed and splendid business activity. In the shops for heavy electrical machinery operations are at almost the limit of capacity in large generator work, and the railway motor works presented an animated scene, which was not to be found even a few months ago. An order approximating $1,000,000 for 15 5,000-horse-power generators for the St. Lawrence Construction Company is to be executed in these works. Altogether, the outlook, as assured for the Westinghouse Electric and Manufacturing Company, is most encouraging, and it may be said that this feeling of hopefulness extends to the officers and directors of the company.

The other Westinghouse interests, including the Westinghouse Machine Company, the Westinghouse Glass Company, the Westinghouse Air-Brake Company, the Union Switch and Signal Company (the latter, by the way, has just been awarded a very large order for railroad equipment), and the many other companies dependent on the Westinghouse industries have almost generally the appearance of prosperity.

The remark, "When Pittsburgh is smoky she is prosperous," may be used now, for a feeling of business revival and improvement pervades the entire industrial community, and her factories, and her vast steel establishments, with all the allied mechanical industries which give this community the honor of being the pulse of the industrial and manufacturing interests of the country, are to-day in a more active condition than in three years past.

TELEPHONE NEWS AND COMMENT.

The International Bell Telephone Company, Limited, of New York, has certified to the Secretary of State a reduction in its capital stock from $1,000,000 to $750,000. The debts and liabilities do not exceed $100,000.

Mr. Thomas, of Thomas & Hunter, telephone contractors, of Richmond, Va., spent several days in New York city last week. Mr. Thomas reports that the independent companies are making good progress in the South.

The Lundquist Automatic Telephone Company, of Sterling, Ill., has been incorporated, with a capital stock of $100,000. Directors, R. J. Shay, W. M. Quigley, Geo. McAlister, J. E. Junkin, M. E. Richardson, Frank A. Lundquist and John Anderson.

Another effort is being made to connect Crete, Bemes, Endor, Eagle Lake and Goodenow, Ill., by telephone. A connection is also contemplated with a line entering Chicago. The business men of the different places are expected to furnish the necessary capital.

Robert Goelet and the New York Telephone Company filed plans on June 25 for an eight-story brick building for shops, costing $175,000, to be erected at No. 30 to 34 Gold street, New York city. The New York Telephone Company will occupy the property.

The Western Telephone Construction Company, of Chicago, has entered a suit in the United States Circuit Court, in Boston, against the American Bell Telephone Company for alleged infringement on telephone instruments. The patent was granted to James E. Keelyn on April 27 last, and the following day it was assigned by him to the complainants. It is alleged that the defendants are using the patents on their switchboards in Boston and other parts of the United States.

Extending the Third-Rail System.

The successful working of the third-rail electric road between Hartford and New Britain, Ct., and the receipts from traffic, which have exceeded expectations, have led the New York, New Haven & Hartford Railroad Company to put 100 men to work double-tracking the road between Berlin and New Britain. A single track is already equipped with the third rail, but has not been operated regularly, because the management wished to get definite information from the experiment on the line to Hartford. The company also intends to extend the line out to Bristol and Plainville, which are already connected by trolley lines with Hartford. These two manufacturing towns will soon have a connection with Hartford by the third rail also. This will make about 22 miles operated by this system, paralleled the entire distance by trolley lines.

NIAGARA POWER.

A LECTURE DELIVERED BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION, NIAGARA FALLS, N. Y., JUNE 9, 1897, BY L. B. STILWELL.

Sixty-eight years ago, M. Guizot, professor of history in the Faculty of Literature, Paris, delivered a remarkable course of lectures upon the general history of the civilization of modern Europe. In the introduction to these lectures, he divided the facts and forces that operate to advance civilization into two classes: First, those that help to shape the history of a nation by influencing society as a whole—"Its institutions, its commerce, its industry, its wars, the various details of its governments," and, second, "certain facts which, properly speaking, can not be called social—individual facts, which rather concern the human intellect, than public life—such as religious doctrines, philosophical opinions, literature, the sciences and arts." "These latter forces," he says, "seem to offer themselves to individual man for his improvement, instruction or amusement, and to be directed rather to his intellectual melioration and pleasure than to his social condition." "Yet, still," he continues, "how often do these facts come before us—how often are we compelled to consider them as influencing civilization. In all times, in all countries, it has been the boast of religion that it has civilized the people among whom it has dwelt. Literature, the arts and sciences, have put in their claim for a share of this glory, and mankind has been ready to laud and honor them whenever it has felt that this praise was fairly their due."

I invite your attention to this quotation, not because the facts and forces referred to were at the time sketched in anything but their true relative proportions, not because Guizot's perspective was incorrect for the year 1829, but because the perspective of his picture was at that time true, and because since that time one of the forces to which he refers—then in the background—has grown into the foreground of every true picture of the forces contributing to modern civilization that can be painted to-day. A few years after these lectures were delivered, the first steam locomotives in England and America were put into operation. In 1831, Michael Faraday observed that a copper disk revolved in the field of a magnet was traversed by an electric current, and now, within the short span of a scriptural lifetime—three score years and ten—engineering science by steam and electricity utilizing natural forces, practically unobserved throughout all the long centuries preceding, has effected a greater change in man's social condition, and has, perhaps, done more to promote civilization than any other civilizing force. In a history of civilization what a place must now be given to the art of steam engineering, the applied science of thermo-dynamics; not as "rather concerning the human intellect than public life;" not as "offered to individual man for his improvement, instruction, or amusement;" not as "directed rather to his intellectual melioration and pleasure than to his social condition;" but, on the contrary, as profoundly affecting social conditions by cheapening the necessities and comforts of life, by reducing the hours of labor and by imparting an almost incalculable stimulus to intellectual activity in every direction. And what a place must now be accorded to applied electrical science; covering the earth with lines of instant communication; bringing all lands into touch; lighting the dark places in our cities; doubling areas available for suburban residence; separating the very molecules of matter into their constituents, or forming new compounds; and now, beginning to turn the wheels of industry in hundreds of factories and mills.

It is unnecessary to demonstrate to this audience that well distributed acquisition of material wealth is desirable, and tends to advance civilization. It will be conceded at once that a wise and not wasteful utilization of natural forces, cheapening the cost of power for a community, is praiseworthy. We all believe that there is in the universe a certain fixed quantity of matter, which we are powerless to increase or decrease, and we accept the doctrine, first fully enunciated by Helmholtz, that Nature provides also a fixed quantity of energy, to which we can add nothing and from which we can take nothing away.

A man considered as an engine and compared with the vast supplies of energy available in coal and falling water, is capable of but an insignificant amount of work. It has been calculated that a very strong man, exerting himself very violently, can, for a few minutes, work at a rate approximating one-fifth of a horse-power; but we have only to remember that one-fifth of a horse-power means 5,600 foot-pounds per minute, and that this is equivalent to lifting 110 pounds, one foot every second, to perceive that the calculation does not apply to the average man performing continuous work by the hour. Considering work continued for 10 hours per day, I think it is safe to say that the average output of 50 strong laboring men, working steadily and faithfully, would not exceed one horse-power, and it is probably no exaggeration to say that the power of Niagara exceeds the physical power which the whole human race is capable of continuously exerting.

Niagara is a great solar engine. You all understand the cycle. Water raised by the sun from sea and lake and river is precipitated to the earth by changes of temperature, finds its way into the Great Lakes, and thence, by the Niagara River, to the rapids above the falls, more than 200 feet above the level of the water in the gorge immediately below the cataract. To raise a pound of water from the river below the gorge to the head of the rapids, a force of one pound must be exerted through a distance of, say, 200 feet. Therefore, every pound of water at the upper end of the rapids represents 200 foot-pounds of energy, which are given up in falling to the lower level. The rate of flow exceeds 7,000 tons of water per second, and the total horse-power is estimated (by the United States census of 1880) to exceed 5,800,000 horse-power. That is an enormous amount of power. Let us see how much coal we should have to burn to develop as much. A committee of the National Electric Light Association, several years ago, made a systematic effort to ascertain the economy in the consumption of coal obtained in electric light stations throughout the United States. The final report of this committee is not before me, but the preliminary report, submitted at the convention in St. Louis, March 1, 1893, showed that the average consumption of coal in these stations per horse-power hour, measured, as I understand, by electrical measuring instruments on the switchboard, slightly exceeded six pounds. At this rate, it would be necessary to burn more than 130,000,000 tons of coal per annum to develop power equal to that of the Niagara River from the upper limit of the rapids to the gorge below the falls. This would be substantially one-third the coal product of the world, and would materially exceed the entire amount of coal now used for power purposes. With the best of modern steam plants, the consumption of coal would still exceed the entire annual output of the anthracite coal fields of Pennsylvania. Making all necessary allowance for loss in a hydraulic plant, the power of Niagara Falls, if it could be utilized as a whole, would supply more than 3,000,000 arc lamps of 2,000 nominal candle power each. An idea of what that number means may be obtained by imagining a row of arc lamps on either side of a railway track extending from New York to San Francisco. Were the number named available, 2,000 candle-power lamps might be located on either side of the track at intervals of 12 feet throughout the entire distance. Expressed in terms of 16 candle-power incandescent lamps, there is sufficient power to drive 600 generators like those now installed in the power-house of the Niagara Falls Power Company, each of which supplies energy equal to that required by about 75,000 50-watt lamps; or, to put it in still another way, the power of Niagara, if used for the refining of copper by electrolysis, would deposit more that 2,000 net tons per hour.

There is an important difference between using the energy of coal and utilizing the energy of water-powers for power purposes. Coal once burned can not be used again. Water-powers, on the other hand, are solar engines perennially renewed. We may utilize the energy of Niagara to-day without subtracting a single horse-power from that which nature intended not only for our age, but for future ages. The thought, therefore, immediately suggests itself that we should, so far as possible, utilize our water-powers in the mechanic arts, burning coal only for our protection from cold, for the preparation of food, for necessary metallurgical purposes, etc. If this be impracticable, we should at least see to it that our utilization of the energy of coal does not involve undue waste.

Of course, not all of the power of Niagara can be utilized. Aside from æsthetic considerations, which will, perhaps, for all time prevent the utilization of a sufficient amount to impair the beauty of the falls, and considering the subject simply as an engineering problem, large deductions from the figures above named must be made to cover the difference between the total and the effective head, this difference representing the fall in canals and tunnels conveying water to and from the wheels. I suppose that it would be possible to deliver about 4,000,000 horse-power to the turbines, and of this amount the turbines would deliver about 3,200,000 horse-power at their shafts.

At this point—the shaft of the turbine—engineering science for a long time halted. Water-wheels appear to have been used at least 2,000, and probably 4,000, years ago, though not extensively. Every water-wheel necessarily had a shaft upon which it was supported and about which the blades revolved. The problem was, how might the power be conveyed from the shaft to a point where it could conveniently be made to do work. Naturally enough, men first used for this purpose something they could see, and handle, and readily comprehend. They used wooden shafts, then ropes and belts. Then some one thought of using a liquid, and the science of hydraulics began. Still later, somebody suggested using a gas—compressed air—and pneumatic transmission attempted to solve the problem.

When the officers and directors of the Cataract Construction Company came to decide what methods of developing and distributing the power of Niagara should be adopted, they faced a problem of transcendent importance. It involved far more than the mere capital to be invested; it involved, in no small degree, the future development, the prosperity of a territory bounded by a circle having for its radius the utmost distance to which the future advancement of engineering science might make it possible to transmit power; and the decision of the company, carrying a project inaugurated on so vast a scale, occupying so conspicuous a position in the eyes of the scientific and engineering world, must inevitably exert a powerful influence upon the great world problem of the economical utilization of our supplies of natural energy. To utilize and distribute over the widest range, with the least waste, with the greatest certainty and in form adapted to the widest variety of applications—these were the conditions to be met. To enumerate them now is to suggest to all our minds, with absolute certainty, electricity, the Proteus of engineering science as it exists to-day; but it must be remembered that when those who inaugurated and have thus far carried out the project began their study of the problem, the possibilities of electricity had not been demonstrated and recognized as they are to day. At that time, the relative advantages and the limitations of water, air, rope transmission and electricity were less evident than now, and it was necessary to examine with great care, and weigh with accurate judgment, the merits and defects of many different plans. This the company proceeded to do with remarkable patience, thoroughness and ability, inaugurating a competition which many of the most prominent engineers and manufacturing firms of Europe and America were invited to enter, and offering prizes for the best solution of the problem. The question was in no sense begged at the outstart. The company did not select electricity because it was the newest agent for transmitting power, nor because the general public was (as it still is) disposed to assume that electricity is necessarily the agent best adapted to the solution of every engineering problem. They arrived at their decision to use electricity only after several years of investigation, in which, practically without regard to cost, they endeavored to secure the best of engineering talent, and in which they allowed no prejudice and no difficulty to narrow or limit their cosmopolitan search for the best solution.

(To be concluded.)

Coming Conventions.

The following conventions, of interest to the electrical fraternity, will be held on the dates named:

Northwestern Electrical Association, at La Crosse, Wis., commencing Wednesday, July 21.

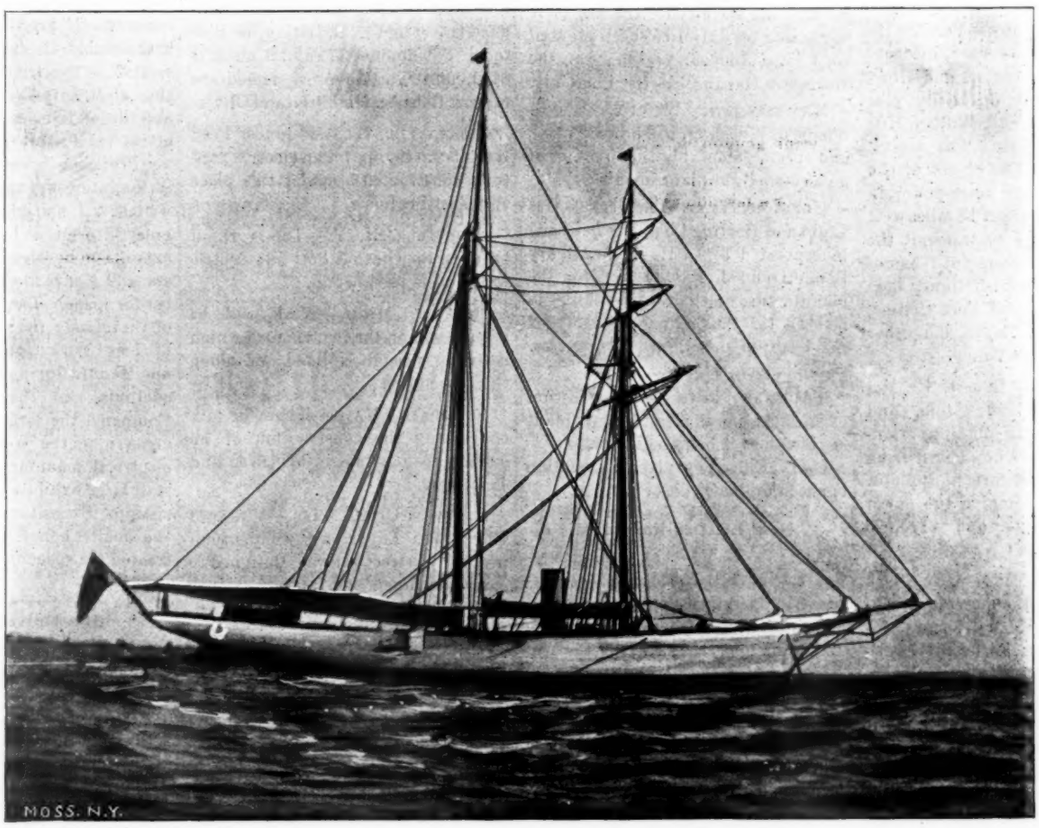
New York State Street Railway Association, at Niagara Falls, N. Y., Tuesday, September 14.

Association of Edison Illuminating Companies, at the Cataract House, Niagara Falls, N. Y., Tuesday, Wednesday and Thursday, September 14, 15 and 16.

American Street Railway Association, at Niagara Falls, N. Y., beginning October 19.

A "Safety" Outing.

There is something unusual in what is implied by the above headline when relating to the Safety Insulated Wire and Cable Company, of this city. Usually, when this firm's name appears in print, it is to record some prominent underground contract recently secured or the mention of the laying of a submarine cable. "All work and no play makes Jack a dull boy"—at least this is the way General Manager Requa looks at it. Fortunately for the employés of this company these sentiments were shared by the president of the company, Gen. Benjamin M. Whitlock. General Whitlock is the owner of the "Hildegarde," the latest and most talked-of yacht of importance to be seen in New York Harbor. She is what is known as an auxiliary topsail schooner, 135 feet long, and is a boat with a unique history. She was formerly owned by the Prince of Wales, and, while flying his colors, she made several trips around the world with her illustrious owner and his guests. She was afterwards purchased by George Gould, who brought her to this country. After General Whitlock purchased her he converted her into an auxiliary, and now enjoys the luxury of a steam and sailing yacht combined. Her engines are of the latest Herreshoff type, and, with the electric light plant, take up but comparatively little space, and leave her owner and his favored guests the luxurious and spacious cabin facilities formerly enjoyed by the Crown Prince. An indication that General Whitlock appreciates electrical possibilities aboard a boat, aside from the model lighting effects from miniature lamps, a never-failing electric cigar-lighter, of his own invention, does constant duty on a center table in the main saloon. On a recent afternoon Mr. Requa arranged to have the heads of departments of the Safety Company avail themselves of an invitation given by General Whitlock to take a trip down the Bay. The Safety party was met at Bay Ridge by the "Hildegarde's" naphtha launches, and was conveyed without loss of time to the yacht. General Whitlock, who is the rear commodore of the Atlantic Yacht Club, is a famous host. He placed the yacht at the disposal of his guests, who were not under the necessity of asking for what they didn't see, for everything was in plain sight. After a most delightful sail, the only cause for regret being the absence of Mr. Requa, who, with the superintendent, Mr. William Marquette, remained at the factory to see to its running in the absence of the heads of departments, the party returned to Bay Ridge, and before departure three rousing cheers were given President Whitlock. Among those present were: Secretary Benjamin F. Baldwin, Avery Eckert, I. W. Henry, H. T. Richards, of the sales department; William Bogart, J. E. Keepers, J. Kuda, R. O. Smith, W. Dykeman, G. W. Nelson, G. Eckert, R. Dwyer, T. Adams, J. Hanlon, M. J. DeLuma, P. H. Galin, J. Connor and F. A. Williams.



THE AUXILIARY STEAM YACHT "HILDEGARDE," OWNED BY GEN. BENJAMIN M. WHITLOCK, PRESIDENT OF THE SAFETY INSULATED WIRE AND CABLE COMPANY, OF NEW YORK CITY.

At the annual meeting of the stockholders of the Sandusky, Milan & Norwalk, Ohio, Electric Railway, the following directors were elected: Geo. H. Dewitt, W. H. Gilcher, Valentine Fries, L. W. Hull, Henry Kelley, Jacob Kuebeler, J. D. Parker, J. W. Stoakes, T. B. Taylor, B. C. Taber, R. Turner, John Whitworth. The directors met later and selected the following officers: President, Geo. H. Dewitt; secretary and general manager, J. D. Parker; treasurer, A. W. Prout.

GENERAL NOTES.

The Derry, N. H., Electric Light Company, is soon to put in two boilers of improved Manning type, each of 175 horse-power. Extensive improvements are to be made at the electric light station.

The Holland Trust Company, of New York, has begun foreclosure proceedings against the Newark Electric Light and Power Company, of Newark, N. J., upon bonds of $50,000 held by the Trust company.

The Frankfort, Tenn., electric street railway has been sold under a decree of the Federal Court, and was bought in for $10,000 by Charles R. Crain, of Springfield, Ohio, who represented a majority of the bondholders.

The Staten Island Electric Company, through John J. Kenny, its counsel, has obtained a temporary injunction restraining the Board of Trustees of the village of Edgewater, S. I., from granting a franchise to the Midland Electric Company to place electric lights in the village.

Capt. W. W. Humphries, president of the Columbus Gas Company, Columbus, Miss., has closed a contract with the Fort Wayne Electric Corporation, of Fort Wayne, Ind., to put an electric plant with a capacity of 1,200 incandescent lights to be in operation by September 1. C. B. Bolton will manage the plant for Captain Humphries.

A special meeting of the stockholders of the Amsterdam Electric Light, Heat and Power Company has been called for July 14, for the purpose of increasing the capital stock from $500,000 to $1,000,000. This is the company which recently bought out the State Electric Light Company, and has begun to open some of the streets in Brooklyn, N. Y.

La Societe d'Eclairage Electrique de St. Petersburg is the title of a new company which has just been formed in Brussels, with a capital of $1,200,000. This company, it is reported, is to acquire and work the concession granted for the electric lighting of the public streets of St. Petersburg. The company, it is further reported, will require considerable machinery and apparatus.

A. J. Moore has just completed a telephone line from San Antonio to Kerrville, Tex., a distance of about 95 miles. A small telephone exchange will probably be installed in the latter city. Mr. Moore is the president of the Eureka Telephone Company. The company also has a line from Gonzales to Yoakum, Tex., a distance of 30 miles, with five stations, all doing well.

Thomas R. Jernigan, United States Consul-General to China, is the author of a most valuable and practical paper in the *North American Review* for July on the "Commercial Trend of China." Mr. Jernigan enters exhaustively into his subject and from his carefully compiled figures the business man may form an intelligent opinion as to the direction in which the volume of China's trade is moving, and the probable extent of the demand of Asiatic markets for American wares. Among the short articles in the July number is "The Storing of Atmospheric Electricity," by E. B. Dunn.

ADVANCE INFORMATION

Electric Light and Power.

BALTIMORE, MD.—An electric light plant will be erected at the eastern pumping station. The cost of the improvement is expected to be about $2,700.

WINNEBAGO, WIS.—James E. Heg, president State Board of Control, Milwaukee, Wis., may give information concerning establishment of an electric light and power plant for the Northern Hospital for Insane.

SAYRE, PA.—E. J. Connelly, chairman light committee, may give information concerning lighting of streets with electricity.

LANCASTER, OHIO—H. T. Mechling, city clerk, may give information concerning gas and electric light fixtures for new City Hall building.

FORT COLLINS, COLO.—The Poudre Power Company has been incorporated. The incorporators and directors of the company for the first year are: Rollin Q. Tenney, William Rist and Charles F. Davis. The capital stock is $50,000. The object of the company is to create water-power in the Poudre Canon about 12 miles west of Fort Collins and to transmit the same to a system of powerful dynamos and to thereby furnish light, heat and motive power for Fort Collins, Greeley, Windsor, Eaton and other towns in the Poudre Valley.

JACKSON, MISS.—Robert E. McKisson, of Cleveland, Ohio, and others, who recently obtained franchise for railway, are now considering the erection of an electric light plant. It is proposed to combine the power and lighting plants, and $120,000 may be expended.

PORT GIBSON, MISS.—City Clerk may be addressed concerning construction of electric light plant, for which Saunders & Porter, of Louisville, Ky., have been awarded contract.

VALLEJO, CAL.—Vallejo Electric Light and Power Company has been formed by K. Casper, Julius Newman, Leopold Breuner, Gustave Breuner and Isador Rosenberg. Capital stock, $100,000.

LYNCHBURG, VA. — The Lynchburg Light and Heat Company has been organized with the view of supplying Virginia cities with acetylene gas for lighting and heating purposes.

JACKSONVILLE, FLA.—The Jacksonville Electric Light Company; machinery and dynamos for new plant, nearly all in place, and a large force of men are at work changing the wires from the old plant on State street, near Main, to the new works, which will be in running order in a few weeks.

VICTOR, COLO.—The Victor Light, Water and Motor Company contemplates the erection of a new power plant.

BAY ST. LOUIS, MISS.—City Clerk may be addressed concerning erection of electric light plant.

WACO, TEX.—C. C. McCullough, Mayor, is inviting proposals until July 7 for furnishing from 100 to 200 electric arc lights for a period of 10 to 15 years; also sealed proposals for erecting an electric light plant to be paid for in 10 annual payments by the city.

EATONTON, GA.—The Eatonton Electric Company, J. W. Preston, general manager, has let contract to the Electric Supply and Construction Company, of Savannah, Ga., for new electric light and power plant, and will utilize water-power three and one-half miles distant.

RANTOUL, ILL.—An electric light plant is to be put in at this place.

WESTFIELD, PA.—An electric light plant is to be established here soon.

TAYLOR, PA.—Bonds are to be issued for building an electric light plant and waterworks.

ROCHESTER, N. Y.—The contract for lighting the city for the five years beginning on July 1 has been granted to J. Lee Judson, president of the Rochester Gas and Electric Company.

MANNINGTON, W. VA.—H. L. Sands, of Wheeling, will prepare plans and specifications for the erection of an electric light plant in this city.

HOUSTON, TEX.—The Texas Gas Light and Heating Company has been incorporated by C. H. Burns, Henry Bennett and J. R. Christian for the manufacture and sale of machines to be used for the manufacture of gas for heating and lighting purposes. Capital stock, $15,000.

THURMAN, IOWA — The question of establishing an electric light plant at this place is being agitated.

C. L. Ellis may give information concerning same.

New Electric Railways.

ALBANY, N. Y.—The DeKalb Avenue & North Beach Railroad Company, to operate a street surface road eight miles long, from Covert avenue and Stanhope street, in the town of Newtown, Queens County, to Bowery Bay, has been incorporated. Capital, $200,000. Directors: Henry B. Hyde, of Bay Shore; Louis Fitzgerald, Alfred Wagstaff and Duncan B. Cannon, of New York city; John N. Partridge, John L. Heins, Thomas Clark, Jr., Thomas Ennis and George W. Benton, of Brooklyn.

CHICAGO, ILL.—At its last meeting the Highland Park council passed the ordinance granting a 21-year franchise to the Bluff City Electric Street Railway Company, giving it permission to construct and operate a system of street railway lines on certain streets of the city. The company now has a line in operation from Waukegan to North Chicago. The directors are C. E. Nass, S. D. Talcott, R. J. Douglas, C. A. Murray, B. A. Dunn, G. B. Watrous and J. F. Powell, of Waukegan.

MT. PLEASANT, PA.—A trolley line is projected to span the northern end of Westmoreland County, running from New Kensington to Greensburg, and taking in the villages of Murraysville, Export and Delmont. Colonel Wayman, of New Kensington, is at the head of a syndicate that proposes to connect those towns.

HARRISBURG, PA.—A charter has been issued to the Northampton Electric Railway Company, of Easton; capital, $300,000. The incorporators are James Kerr, Clearfield; George S. Good, Lock Haven; J. Frank Snider, A. O. Smith and G. S. Hues, Clearfield.

MT. CLEMENS, MICH.—The township boards of Erin and Harrison granted franchises for an electric railway on the lake shore road to the Ranney-Fordyce syndicate.

BIDDEFORD, ME.—Articles of association have been filed with the Maine railroad commissioners for an electric road, beginning at this place and running through Saco and Buxton to Bonny Eagle, in the town of Standish, the total length being about 20 miles. The subscribers to stock named are Charles S. Hamilton and William A. Roberts, of Biddeford; James Bradbury Oliver and E. B. Loring, of Boston. The amount of capital stock is $250,000. The directors named are Messrs. Roberts, Hamilton and Oliver.

BELLEVILLE, ILL.—Engineer Fred Reiss is surveying for an electric road to be constructed between this place and East St. Louis.

PORTVILLE, N. Y.—The work of building the Olean & Portville electric railway has been begun.

DETROIT, MICH.—Work will be begun soon on the electric road which is to run through Holland and along the lake shore.

ROCHDALE, MASS.—There is talk concerning the construction of an electric road between this place and Leicester.

COTTAGE CITY, MASS.—Vineyard Haven and Edgartown will be connected by a street railway, designed to carry passengers and freight. Money will be raised, $30,000 being required.

New Incorporations.

CLEVELAND, OHIO—The Inter-Urban Construction Company has been incorporated, the object being to construct an electric railway, with $5,000 capital stock. E. S. Cook, J. H. Webster, R. Threw, J. E. Brocklesby and James M. Kennedy.

SYRACUSE, N. Y.—The Underground Electric Wire Company has been incorporated with the Secretary of State, with a capital stock of $400,000. The company proposes to produce and supply electricity and to construct overhead and underground structures for the purpose of stringing wires. The directors are William B. Kirk, Charles Hughes, Eugene Hughes and Peter J. Mack, of Syracuse; Anson M. Bangs, of New York city; John F. Gaynor, of Fayetteville, N. Y., and Benjamin D. Green, of Stamford, Ct.

DES MOINES, IOWA—The new Sedwick company has been incorporated. The capital stock is $1,200. The company will sell electric batteries, etc. The incorporators are M. V. Sedwick, J. W. M. Heywood and Clinton F. Clark.

Business Troubles.

CONCORD, N. H.—Charles C. Danforth and W. C. Hawkins, of this city, have been appointed receivers of the Concord Land and Water Power Company on the voluntary application of the corporation.

TERRE HAUTE, IND.—A receiver has been appointed for the Terre Haute Electric Light and Power Company, which was incorporated in 1885, with a capital stock of $30,000.

Trans-Mississippi and International Exposition.

One of the officials of the exposition sends the following to the ELECTRICAL REVIEW: "Since Prof. R. B. Owens was placed in charge of the electrical section, department of exhibits, of the Trans-Mississippi Exposition, extraordinary interest has been awakened in the minds of electricians and manufacturers of electrical machinery and supplies throughout the country. If ever there was doubt of a creditable display in the electrical section, at this time there is no doubt that electricity—scientific, industrial and decorative—will form a highly attractive feature of the exposition.

"Professor Owens is now in the East, in the interest of the exposition. He writes: 'I am glad to say a very great interest is being taken in the exposition by electrical manufacturers, and I have already signed a number for space. The Walker Company, of Cleveland; the Okonite Company, of New York; the Cutter Electric and Manufacturing Company, of Philadelphia, and the Western Electric Company, the largest manufacturing concern in the West, are among the electrical manufacturers who will install large exhibits at the Trans-Mississippi Exposition, not to mention the smaller concerns which have contracted for space in the electrical section.'"

Lehigh University Theses.

The following is a list of the theses of the graduating class of 1897 of the Lehigh University, South Bethlehem, Pa., in the School of Technology, department of electrical engineering:

H. L. Bell and H. H. Seabrook: Design and construction of field for a. d.—c. armature.

W. R. Binkley and R. S. Griswold: Investigation of the Edison chemical meter.

C. S. Bowers and L. Diven: Design of a three-phase alternator.

W. E. Brown and O. S. Good: The design and economy of an electric lighting plant for Lehigh University.

I. D. Fulmer and A. R. Sterner: Construction of a storage battery of the Planté type.

W. S. Hiester and H. S. Johnson: Methods of control of street railway cars.

R. N. Hood: Design of a direct-connected dynamo for lighting.

A. P. Jenks (with C. W. Thorn): Plans and specifications for an electric railroad between South Bethlehem and Friedensville.

C. V. Livingston and C. F. Scott: Design of a multipolar railway generator.

A. F. Loomis and C. P. Nachod: Tests of motor electric meters.

B. MacNutt and H. R. Van Duyne: Analysis of coal by means of X rays.

A. H. Serrell and P. B. Straub: Tests of electrically heated utensils.

G. L. Yates: The problem of submarine telephony.

Kindred.... ...Interests

The Dennis Fluorometer, for surgeons' use in radiography, is described in a pamphlet issued by the Rochester Fluorometer Company, of Rochester, N. Y.

Dixon's Graphite Paint is brought to the attention of the trade by a neat monthly calendar blotter issued by the Joseph Dixon Crucible Company, Jersey City, N. J.

The Waterbury Farrel Foundry and Machine Company, of Waterbury, Ct., describes and illustrates its foot, drop and screw presses in a recently issued catalogue.

"Strength" is the title of an interesting pamphlet giving hints for health and training, issued by Patterson, Gottfried & Hunter, Limited, 146–150 Centre street, New York city.

"Illustrated Binghamton" is the title of a well illustrated pamphlet issued by the Binghamton, N. Y., Railroad Company. It is published in the interest of Binghamton and its surroundings, and incidentally to boom street railroad traffic.

The Rice Machinery Company, Chicago, Ill., has issued a new catalogue of its power transmission appliances, especially relating to rope driving. This is the most complete catalogue of power transmitting devices that we have seen. Power users should be interested in it.

The Holtzer-Cabot Electric Company—The business offices of the Holtzer-Cabot Electric Company have been removed from their former location, 92 Franklin street, Boston, to the Factory Building, Station street, Brookline, to which place all communications should be addressed.

The Building Department, of New York city, has granted a permit for the Berlin Iron Bridge Company, of East Berlin, Ct., to erect for the New York Steam Company a one-story steel boiler house, 78 by 200 feet, from Fifty-ninth to Sixtieth streets, at East River, at a cost of $125,000.

A. K. Warren & Company, 451–453 Greenwich street, New York city, proprietors of the well known New York Electrical Repair Shops, have issued a catalogue describing their business and a line of electrical supplies which they handle. A specialty is made of emergency and breakdown work, and their repair department is equipped for making repairs to machinery of every description.

Mr. A. M. Morse, who for the past five years has become so favorably known as selling agent of the Buckeye Engine Company for the St. Louis and Chicago territory, severed his connection with that company on the 1st instant, and has taken a suite of offices, Nos. 1108 and 1109 Marquette Building, Chicago. He will make a specialty of high-grade engines for electric service, both Corliss and high-speed type. Mr. Morse has had a wide experience in steam engineering work, and has equipped many of the representative power plants in the southwest. With his extensive acquaintance among the trade, and aided by his many excellent personal qualities, Mr. Morse will have no trouble in securing a very large share of the engine and machinery business throughout this territory.

For Sale.

Two shunt-wound, 125-volt, No. 12 Edison, 30-kilowatt dynamos, with extra armature, rheostats, indicators, ampere meters; self-oiling journals in good condition. Price, $1,000. Two ditto, No. 10 Edison, 25-kilowatt, recently rebuilt, new fields, armatures, commutators, self-oiling journals. Splendid machines, with instruments as above-named—all running. Price, $900. Reasonable traveling expenses allowed to purchasers of machines. Address

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All patents taken out through me are given special notice in the leading journals of the country, thus bringing same widely before the public without cost to inventor.
REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.
EDW. S. DUVALL, Loan and Trust Bldg.,
Solicitor of Patents. WASHINGTON, D. C.

"Dixie." The Southern Industrial Journal, tells the truth about Southern conditions and possibilities. If you are interested, send 25 cents for 3 months or $1 per year. THE "DIXIE" CO., Atlanta, Ga.

Wanted—An Idea Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write JOHN WEDDERBURN & CO., Patent Attorneys, Washington, D. C., for their $1,800 prize offer and list of two hundred inventions wanted.

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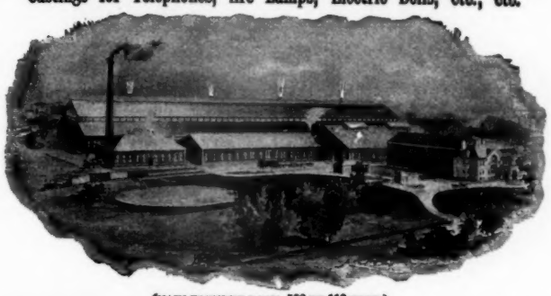
High-Grade Castings for Dynamos, Motors and Electrical Machinery, also Fine Soft Castings for Telephones, Arc Lamps, Electric Bells, etc., etc.



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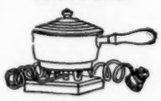
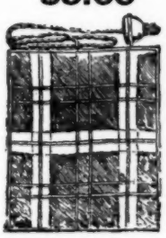


Electric Stew Pan.

Electric Curling Iron Heater.



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The Ritchie Induction Coils
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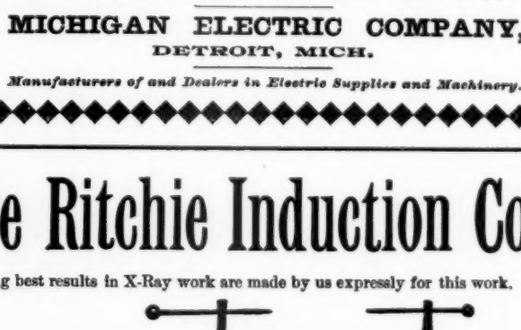

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Send for prices and information; catalogue of fine electrical and scientific instruments free.
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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED JUNE 15, 1897.

584,639 Electric railway; H. M. Jones, Meriden, Ct.—A conduit having a longitudinal slot at its top, and a tubular cable for normally closing said slot, the cable consisting of a spiral coil, the spirals being arranged close together, yet adapted to open or stretch at points lifted from the slot.

584,649 Secondary battery plate and method of producing same; W. P. Patton, Jersey City, N. J.—Comprises a sheet metal partition coated with soluble inert material on each side, and having openings along the edges, and cast-metal perforated sides which are integrally united through the openings in the partition.

584,700 Electrical advertising annunciator for cars; J. P. Orr, Pittsburgh, Pa.

584,722 Perforator for electric telegraphs; C. G. Burke, Brooklyn, N. Y.

584,733 Electric wire barbing machine; W. O Bates, Joliet, Ill.

584,737 Telephone; C. C. Gould, Philadelphia, Pa.—A telephone transmitting apparatus, having a mouth-piece, a series of nipples secured in a wall thereof, a plurality of transmitters, and a connection leading from each nipple to each of said transmitters.

584,750 Incandescent electric lamp; C. E. Scribner, Chicago, Ill.

Aftermath of the Electric Light Convention.

The Simplex Electrical Company, Boston, was represented by Mr. Jas. H. Mason.

McLeod, Ward & Company, New York, were represented by Mr. McLeod in person.

The secretary and treasurer of the Mitchell Tempered-Copper Company, Mr. J. G. Ruhl, was present.

Also Messrs. M. R. Cockey and G. W. Swan, of John A. Roebling's Sons Company, were in attendance.

Mr. E. G. Bernard, of the E. G. Bernard company, Troy, N. Y., was at the International Hotel during the convention.

Mr. H. M. Underwood, of H. M. Underwood & Company, Chicago, exhibited the new "Cloos" junction box for high-potential, direct and alternating currents.

One of the best known of the old-timers in the electrical field, Capt. T. H. Brady, of New Britain, Ct., who is a large manufacturer of hoods, mast arms, cut-out boxes and lighting specialties, did not fail in his duty as a conventionist.

Mr. E. C. Durland, E. E., represented the Interior Conduit and Insulating Company; Mr. J. I. Solomon, the Bryan-Marsh company, New York, manufacturers of incandescent lamps; Mr. Chas. F. Munder, the Davis Electrical Works, Springfield, Mass.

The genial Mr. Wolff, Mr. "Jim" Wolff, manager of the Chicago office of the New York Insulated Wire Company, was with the Chicago contingent. Mr. John T. McRoy, the conduit maker, of Chicago, also came with the Chicago company. Mr. W. D. Packard, of the New York & Ohio Company, Warren, Ohio, was one of the leaders in the incandescent lamp industry present.

The Star-Spangled Banner.

The annual Fourth of July souvenir of the American Electrical Works, Providence, R. I., this year takes the form of a handsomely lithographed folder containing in full our patriotic anthem, "The Star-Spangled Banner." A beautiful silk American flag ornaments the front cover.

American Association for the Advancement of Science.

The next meeting of this association will be held at Detroit, August 9 to 14. The programme of papers to be read before Section B, Physics, includes the following of electrical interest:

"Screening Effect of Induced Currents in Solid Magnetic Bodies in an Alternating Field," by Mr. Charles P. Steinmetz, General Electric Company, Schenectady, N. Y.

"The Design, Construction and Test of a 1,250-Watt Transformer," by Prof. Henry S. Carhart, University of Michigan, Ann Arbor, Mich.

"Electrolytic Action in a Condenser," by Dr. K. E. Guthe, instructor in physics, University of Michigan, Ann Arbor, Mich.

"On the Velocity of Light in a Magnetic Field," by Prof. E. W. Morley, Cleveland, Ohio; Prof. H. T. Eddy, Minneapolis, Minn., and Prof. D. C. Miller, Cleveland, Ohio.

"The Transmission of Radiant Heat by Gases at Varying Pressures," by Mr. Charles F. Brush, Cleveland, Ohio.

"The Discharge of Electrified Bodies by X Rays," by Dr. C. D. Child, Cornell University, Ithaca, N. Y.

"The Effect of Heat on the Elastic Limit and Ultimate Strength of Copper Wire," by Prof. Frank P. Whitman, Adelbert College, Cleveland, Ohio, and Mary C. Noyes, Ph.D., Lake Erie Seminary, Painesville, Ohio.

"Arc Spectra," by Prof. Arthur L. Foley, University of Indiana, Indianapolis, Ind.

"The Electric Conductivity of Certain Specimens of Sheet Glass, with reference to their Fitness for Use in Static Generators," by Prof. Dayton C. Miller, Case School of Applied Sciences, Cleveland, Ohio.

"Graphical Treatment of Alternating Currents in Branch Circuits in case of Variable Frequency," by Prof. H. T. Eddy, Minneapolis, Minn.

"On Simple Non-Alternating Currents," by Prof. Alexander MacFarlane, Lehigh University, South Bethlehem, Pa.

"Exhibition of Instruments for determining the Frequency of an Alternating Current," by Prof. George S. Moller, Ithaca, N. Y., and Dr. Frederick Bedell, Cornell University, Ithaca, N. Y.

"The Predetermination of Transformer Regulation," by Dr. F. Bedell, Cornell University, Ithaca, N. Y., Prof. R. E. Chandler, Salem, Va., and Mr. R. H. Sherwood, Brooklyn, N. Y.

Northwestern Electrical Association.

As announced in last week's ELECTRICAL REVIEW, the fifth semi-annual convention of the Northwestern Electrical Association will be held at the Cameron Hotel, La Crosse, Wis., beginning Wednesday morning, July 21.

Papers on "Meter Tests," "220-Volt Lamps," "Use of Oil in Transformers," "Utilization of Exhaust Steam," "Evolution of the Incandescent Arc Lamp," "Rotary Transformers" and "Fuels for Central Stations," will be presented by Prof. D. C. Jackson, of Wisconsin University; Prof. G. D. Shepardson, of Minnesota University; Prof. R. B. Owens, of Nebraska University; George L. Thayer, of Iowa; O. M. Rau, of Wisconsin; C. F. Scott, of Pennsylvania, and John C. McMynn, of Illinois. The entertainment committee has arranged an enjoyable programme, including a river excursion and picnic lunch, trolley parties, etc.

Secretary Thos. R. Mercein informs the ELECTRICAL REVIEW that 110-volt direct and 7,200-volt alternating current, with abundant space, will be at the service of exhibitors. Address F. A. Copeland, La Crosse, Wis., for hotel and exhibit accommodations.

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